COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

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Dreams Come True

A FEW YEARS AGO organization of soft-coal producers into a commercial research agency was only a dream. Today, thanks to the enthusiasm and hard work of the adventurous spirits who could envisage its possibilities, the dream has become Bituminous Coal Research, Inc.; the first research project actually is under way and others are in the making. These projects embrace studies in more effective utilization of coal as a raw fuel and in new uses. Both types of studies are essential to a sound program, but the potentialities of scientific exploration into the still uncharted area of new uses excite fresh dreams of future expansion of production.

Rivers of Rock

IN MANY PARTS of the coal field, large prehistoric rivers have removed extensive areas of the coal seam, wholly or in part, and replaced them with sandstone and sometimes shale. This is characteristic of large parts of central Pennsylvania and even of parts of the Lower Productive Measures in the western end of the State. In other places, especially in southern West Virginia, the coal seam comes to an end, not because of eroding rivers but because the peat bogs had a limited area. Faults also cut out seams; rarely, however, in the United States.

Drilling hitherto has been used to find these seam defects which interfere with operation. But drilling is expensive and may reveal a full-size measure which when reached by mining may be found to be only a foot or so from a fully developed "coal want." Many companies have exhausted their resources by driving rock tunnels in the hope of penetrating these bodies of sandstone and arriving at coal seams beyond.

For these companies geophysical researches promise a means of accurately determining the edges of the coal deposit—if not of its thickness also—at much less expense than by drilling and tunnel driving, and doing it so early that the mine can be laid out and its tonnage forecast with accuracy. In Ontario geophysical surveys to delimit a lignite deposit have been made by the Provincial Department of Mines, and in France the edges of a lignite deposit below a hundred feet or more of loose sand was similarly surveyed.

Joint Responsibility

WITH THE SIGNING of the new Appalachian wage agreement, the threat of any major interruption in bituminous-coal production for many months has been definitely removed. This is a distinct public gain—and both operators and union officials are to be congratulated for making it possible. Whether the new agreement of Sept. 27 and contracts granting similar increases in other bituminous fields will prove advantageous or a handicap to the industry itself, however, will depend largely on how wisely this new instrument for peace is used.

The past record of the industry is persuasive evidence that progressive coal-mine management is as firmly committed to the theory of high wages as the workers themselves. But successful translation of that theory into actual practice involves application of another phase of the mass-production principle which has made increasing wage rates both supportable and profitable. That phase contemplates continuous reduction in total and unit costs of production while wage rates remain constant

or advance. And the secret of this departure from the older relationships between production costs and wage rates is to be found in mechanization.

Restatement of principles so axiomatic in the newer and more enlightened machine-age philosophy seems warranted at this time because wage-negotiation discussions placed so much inferential emphasis on price maintenance as a prerequisite to wage stability. Price control is unquestionably desirable and necessary as a check on ruinous internal competition. The greatest danger, however, is external, and the coal industry cannot afford to be at a price disadvantage in the battle of competitive fuels. It must be prepared to meet competition without sacrificing either its profits or the living standards of the mine workers.

Responsibility for lower production costs rests jointly on management and on men. Management must be ready and willing to make investments in equipment and modernization methods which will reduce costs without depressing basic rates of pay. Labor must be ready and willing to cooperate with management in making such investments profitable—even if such cooperation means the temporary displacement of some men. In no other way can the industry hope to expand its markets permanently and so increase the opportunities for employment in the mining districts.

Mile a Minute

MANY MINES pass air in the main returns at a speed of a mile a minute and many more have speeds as great or greater than that in their shafts. Air traveling at that speed has a resistance as great as that experienced by a fast train traveling in still air. Ribs, roof, floor and timbers are moving in such mines at a relative speed to the air equal to that of crack expresses. No wonder the problem of streamlining mine roadways furnishes a problem as vital as that confronted by railroads, street cars, buses and automobiles.

But the speeds mentioned are not as large as actually exist. Behind an obstruction the air is traveling slowly, not traveling at all, or traveling backward. Some of the airway is not partaking at all in the forward movement. So actual speeds must be greater—sometimes far more than mean speeds—thus increasing resistance. Care in heading alignment is absolutely essential. At one mine all deviations from sights are reported to the chief engineer, who makes it matter for diligent inquiry and discipline. But roughness is as fatal as irregularity. Roof falls and crosscuts are as harmful as other roughnesses. Projected concrete should be used wherever roof falls are to be expected, to prevent irregularities in the roof, whether natural or the result of timbering, especially where express speeds are involved.

Increased pressure involves leaks, and, if air quantities are to be measured at the face—as they should be—leaks make it necessary to deliver more air at the fan and to operate it at higher pressure if the required volume is to be delivered. A time comes when greater pressure will not increase volume, for leaks will bleed it off and prevent it having the desired effect. Streamlining, therefore, reduces resistance indirectly as well as directly.

Why Stop Plowing?

STOCKHOLDERS AND DIRECTORS of Appalachian Coals, Inc., have been busy in recent months debating the future of that pioneering organization in district and regional sales agencies. The argument, heard faintly during the heydey of NRA, that the province of such agencies was being preempted by government bureaus has acquired greater volume since the enactment of the Guffey bill. If price fixing is to be a government function and its benefits are to be conferred on all mines, why, it is asked, should any group of producers contribute to the support of a cooperative sales agency which can offer no greater protection than Uncle Sam gives to non-contributors?

Were price fixing the only service private agencies such as Appalachian Coals had to offer, the question might be difficult to answer. But, when measured against the work already done in market research, fuel engineering and sales promotion and the still untapped possibilities in those fields, price-control activities become of secondary importance. If pricing activities were entirely eliminated, the services rendered in the other fields named would more than justify and repay the cost. No government bureau can be expected to do this job; only a very few of the larger producing companies could attempt to duplicate it. Abandonment of the work would be wild extravagance—not economy.

SAFETY AND EFFICIENCY

+ At Allegheny Pittsburgh Mines

Go Hand in Hand

QUEST for safety in and through efficient operation of all departments of production is exemplified at the Springdale mine and plant of the Allegheny Pittsburgh Coal Co., Logans Ferry, Pa., which, with 540 employees, produces about 3,600 tons daily. That safety and efficiency stem from the same root, in the belief of the heads of this operation, is well attested by the fact that the mining engineer has been charged with the safety work and now carries the additional title of "safety engineer." He had a single assistant before the change was made and now has two, so that this additional function will not be slighted. Every week he makes a report on any features in operation that are unsafe and on any unsafe practices he or his assistants have observed. This report goes to the foreman, the superintendent and the general superintendent, so that any improper condition may be known and corrected.

The roof of the Thick Freeport seam in Allegheny County, it is generally conceded, has some quite desirable characteristics. At Springdale it usually consists of a cannel slate about 14 in. thick immediately over the coal, which in mining is left undisturbed. This is surmounted by 10 to 30 ft. of black slate topped by a thick body of sandstone. The cannel at this mine generally is strong and adheres to the slate above it, furnishing a good supporting material. Under such severe stress as may be experienced in some headings in case of delayed roof breaks, the cannel may fracture and fall, but usually it is a reliable measure and free from "kettle-bottoms." But, when the cannel does fall, the shale lying above it is with difficulty retained in place, for it is rotten and will not stand without support. As a rule it must be arched back up to the sandstone. In some places, however, the sandstone appears immediately over the coal bed and, on rare occasions, displaces some of the upper coal bench.

With a soft fireclay floor at least 6 ft. thick and possibly far more, for it has not been explored, such a strong roof is extremely difficult to break, and unless and until an area as large in one dimension as the thickness of the overburden is extracted, the roof will not break to the surface and relieve the weight. The fireclay when lifted is found to contain much water, which rises in the excavation to a certain definite level below which pumping will lower it with extreme difficulty. This may account in some degree for the fluidity of the clay bottom under pressure.

The coal seam comprises in the main two benches—a bottom bench of a somewhat weak, pulverulent coal 3½ ft. thick (including in that measurement a foot of floor coal made non-commercial by the presence of two or three little slate bands), a 12-in. binder of high-ash coal too poor for commercial use and a 2½-ft. bench of hard, clean top coal, making in all 7 ft. of which 5 ft. is commercial and 6 ft. is removed in mining. In rooms, crosscuts and cut-overs, the binder is cast back into the gob, but in all headings it is brought to the surface for disposal in waste heaps, where thus far it has failed to fire. About 3 per cent of the gross tonnage hoisted in the shaft is waste material of this type.

In the first seven months of the present year, 459,785 tons of coal was produced without a fatality (in August, there was not even a lost-time accident). The monthly report of the Pennsylvania Department of Mines placed this company first among bituminous operations of the entire State for its record of non-fatal accidents caused by falls "direct or indirect." Direct falls include only those at the working face. It had no direct, indirect or material falls. Since that time a fatality has occurred which probably will be rated as the result of a direct fall, though it appeared some feet back of the working face.

The seam is undercut on the top of the slate bands to which reference has been made. Until the pillars are drawn, this 12-in. bench of dirty coal supports

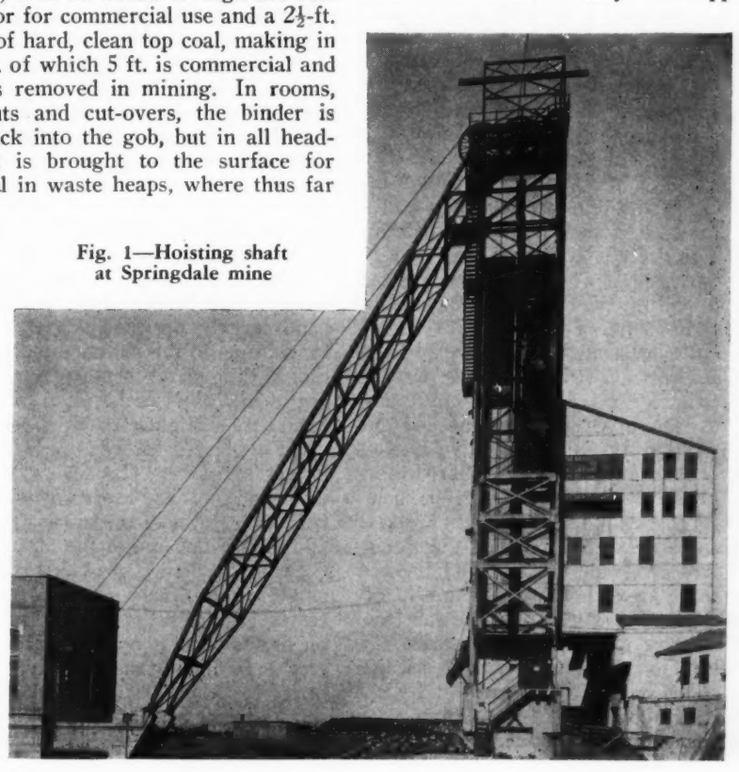


Fig. 1—Hoisting shaft at Springdale mine

the weight of the props and does not allow the floor to heave, but when, in pillar drawing, break-rows of timber are set as the fulcrum on which the roof is to be broken, the props push down into the floor several feet, so that their recovery is everywhere impossible and is never attempted. Once the continuity of the coal covering the clay below is broken, it oozes out from under the unbroken coal areas and leaves them defenseless. Sometimes, to protect the roof, second-hand and worn 60-lb. rails are set over the posts.

Stress is placed on inspection of all timber. It must be straight, free from knots and cross-graining, be not less than 3½ in. in diameter or its equivalent at the small end, and must nowhere exceed 5½ in. in diameter. Sawn caps are provided and used over all posts. These are 1 in. thick, 4 to 6 in. wide and 14 in. long. Because the bottom bench is soft, the binder quite frequently projects from the face after the face has been shot, so sprags have to be used for its support. These, which may be as many as three to a face, are set vertically.

Rooms are necked 12 ft. wide and each neck is 35 ft. long with the sight line 2 ft. to the right of the left rib. When the room is widened it is made 5 ft. wide to the left of the sight line and 11 ft. wide to the right, and the only posts used are set in a line at 4-ft. centers 4 ft. from the right rib. The road is placed in the center of the room. This leaves ample and convenient gob space for piling the binder. Timbers are kept always within 6 ft. of the face. Accordingly, they do not interfere with cutting or loading operations.

Rooms are driven at 90-ft. centers, so the pillars are 74 ft. wide and crossed by 15-ft. crosscuts at 100-ft. centers, giving pillars 74x85 ft. These pillars are now being drawn on retreat from the boundary with break lines which extend in a straight line from one entry to the next; these entries are at 2,000-ft. centers. Much trouble accompanies the making of the first break in any panel. It has been found that the angle of breaking draw is at times as much as 15 deg. Thus, as overburden runs from 600 to 800 ft., the crevice at the surface would lie between 160 and 214 ft. beyond the excavation line.

Until recently it has been the practice (see Fig. 3) to lay tracks in any crosscut as the break line approached the crosscut beyond it, and to drive a roadway up the center of the pillar, timing its advance so that it would be completed through to the next crosscut when the break line reached that point, but this involved weakening of the pillar, more stress on the floor, much difficulty in throwing coal to the car from the remoter parts of the pillar and two right-angled turns in the roadway which had to be negotiated by cars and gathering locomotives. As the bottom often heaved until the motorman could not see over the tops of the cars, it is easy to imagine that derailments and accidents occurred and that much expense was involved in lifting track, lowering bottom and relaying rails.

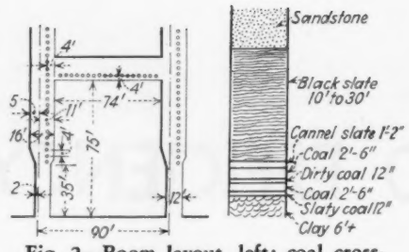


Fig. 2—Room layout, left; coal cross-section, right

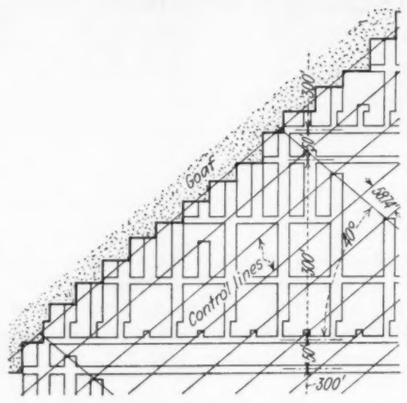


Fig. 3—Former method of removing pillars—by splitting

Consequently, it is now the practice to drive cut-overs 15 ft. wide through the pillar, leaving a pillar 12x74 ft. against the goaf for prompt removal in four sections. The present width of pillars between rooms, however, is subject to revision, though the change will be delayed by the fact that necks have been driven in many butt headings, and the distances thus established must be maintained. Timing has been arranged substantially as set forth in Fig. 4. As no definite stint is set for each man that must be completed every day—that is, as there is no "clean-up" system, but each man does his utmost during the running period—the work cannot be subjected to close timing, but must depend largely on the judgment of the foreman as to the characteristic production of the several men employed. Shifting of men is essential often to keep the face line straight. In this operational chart nothing is intended to be indicated except sequence. The several advances do not in any way represent daily progress. The angle of the break line is kept 40 deg. off the line of the face fracture.

Springdale mine provides coal for a single power plant and therefore operates regularly. Its output is planned on the basis of four days' operation per week. Running thus steadily, the long break lines can be advanced with only short periods of idleness. Except where there is exceptional stress, the face every morning of operation is in better condition for working than it would be in mines with similar physical conditions and like methods of operation but where longer intervals of inactivity intervene. Though the driving of rooms and headings is almost without hazard from falls, the strength of the roof makes necessary the utmost care in posting and in keeping a straight break line during pillar withdrawal, especially when the roof in any section has not been broken already up to the surface.

In the mine at present are only five break lines. There are 19 active headings and 156 rooms and pillars, with two men to each working place, yet the 3,600-ton output is readily made, but, as some of these places are not working every operating day, the output per man figures 12.45 tons per loader. This large tonnage from a concentrated area makes it possible to supervise the entire production with one foreman, three section foremen, one night foreman and to examine the mine for gas with five firebosses; yet the work can be done effectively.

Despite the excellent roof, the big flanking pillars on either side of the "flat" entries—never less than 205 ft. wide—and the 38-ft. chain pillars, there are some weak spots in the roof of the headings, and here steel I-beams are used set on 12x12-in. pilasters made of 6x6x12-in. "red-dog" blocks constructed by local manufacturers from the burned shale piles which surround neighboring mines. All headings are 12 ft. wide.

Springdale mine is definitely gassy, making over three quarters of a million cubic feet of methane every 24 hours, but, by use of safety lamps, adequate ventilation, good red-dog stoppings, line bratticing and careful inspection, the gas is kept under control. The main return at present carries 0.19 per cent methane, which is only about one-fifth as large a percentage of gas as that which careful managers regard as the limit for safe operation. However, the most gassy split has 0.24 per cent of methane. These low percentages are obtained by passing 276,000 cu.ft. of air per minute through the workings at 2.8-in. water gage. The main return shows 285,500 cu.ft. and the summation of the various splits 195,200 cu.ft., showing that 70 per cent of the air reaches the face of the workings, including 7,200 cu.ft. which is used for ventilating the charging stations, etc., around the intake airway. The air velocity nowhere exceeds 2,060 ft. per minute.

The main fan, which is of exhaust type, measures 6x12 ft., is reversible and runs at 160 r.p.m. This ventilates the mine proper. A smaller force fan, which supplies additional air to that already detailed, is used to course the two tunnels which connect the mine on the Logans Ferry side of the Allegheny River with the shaft at Springdale. This small fan is a 6-ft. straight-flow unit which delivers 25,000 cu.ft. of air per minute with 0.3-in. water gage. The air

goes down the top section of the man-and-material slope to the automatic doors which separate the ventilating currents of the tunnel from those of the mine. It ventilates the two tunnels and passes up the main shaft, carrying with it any dust which the revolving dump at the foot of that shaft may create.

At this mine the intakes and returns at the surface are so far apart that there is no risk that the methane which leaves the mine by the return will be sucked into the intake and be recirculated through the mine or that the dust in the return will be carried back into the mine and deposited in the airways. The main current enters the mine in the bottom section of the man-and-material shaft 300 ft. from the air shaft, and the air is entirely free of both methane and coal dust, being about a mile from any tipple or dump. The smaller force fan takes its air on one side of the Allegheny River where there is no dust and delivers it laden with the dust of the dump to the surface on the other side of the river. Unfortunately, it is necessary to cause the air of the main fan to double on its tracks. When a new area is opened to operation it is hoped that a shaft can be provided that will make it no longer necessary to bring the air back to a point only 300 ft. away from which it enters the mine; such a shaft will provide in that manner what will approach one-way ventilation.

To reduce air resistance all main entries consist of four headings, each pair of headings on one side of the entry being intakes and the other pair returns. This applies to the main butt entries and to the faces—here termed "flats," though they are hardly more level than the butts. Room entries consist of two headings only. As the roof is good, both the intake headings of the main butts are used for haulage as far as the eleventh butt intersection, with no stoppings in the crosscuts between them; so the trips in passing interpose little interference with intake ventilation. All returns have been equipped with rock-dust barriers having vanes and tripping devices, all of which cause air to eddy and interpose resistance. It is the intention to rock-dust these headings with a high-pressure dust distributor so that the barriers can be removed and ventilating conditions further improved. The rock dust in the barriers tends to cake, and it is feared that it might not make a curtain of fine dust if disturbed by an explosion. To assure that it will act as desired, the dust has to be renewed frequently, whereas by rock-dusting the headings this recurring difficulty will be eliminated. Haulage is restricted to intake airways.

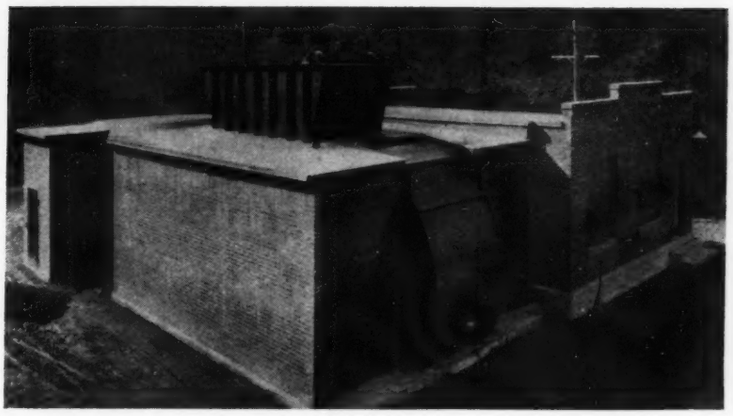
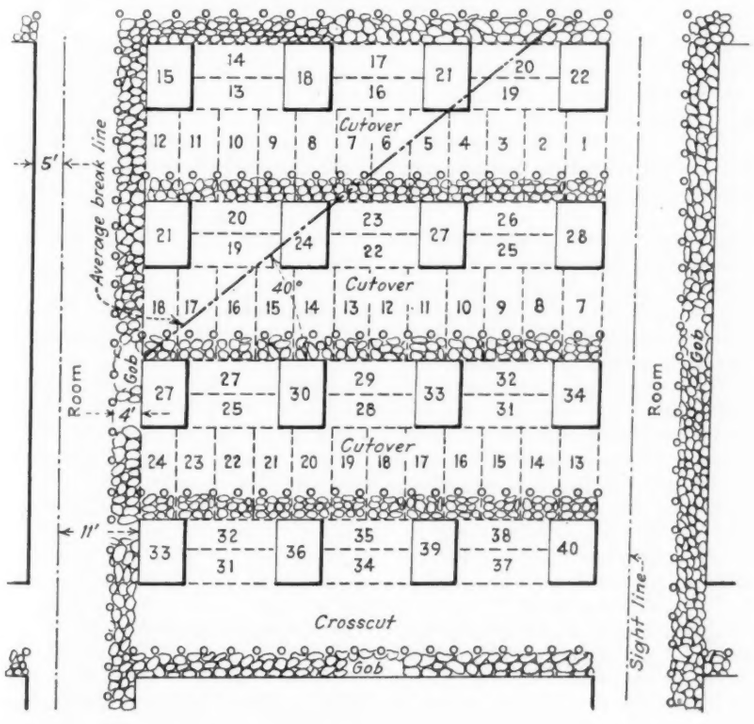


Fig. 5—Main ventilator supplies air to workings

Utmost care has been taken to drive the roads straight, thus preventing turbulence, always a source of more loss of pressure than mere surface friction. Near the intake slope, where the air is traveling at its highest speed, many of the ribs, which normally would be rough because of the irregular butt fractures, have been trimmed with the accuracy that distinguished the art of mining early in the nineteenth century, but some of these ribs, unfortunately, have scaled in places, roughening somewhat their otherwise perfect alignment. Curtains for directing air to the face of the workings are hung from the roof and not nailed to posts.

To reduce the resistance at the base of the 169-ft. main-return air shaft, which has a cross-section of 176.7 sq.ft., the bottom of the shaft was curved out in the four directions from which the air entered into it, but it was feared that the air resistance nevertheless was increased by unnecessary eddying at this point. George McCaa, mine inspector of the district, suggested erecting a four-sided pyramid at the bottom of the shaft which would serve to direct the various air streams, each in the right direction. The management was uncertain as to the best form of pyramid to install, so experiments were made with wood structures having different angles to the plane of the floor, and it was found that a 30-deg. slope to that plane gave best results. With 45-deg. inclinations, some eddying at the foot of the shaft was still found. The sides of the pyramid run out into the four headings which meet at the shaft base. The shape finally adopted is a truncated pyramid, 6 ft. square at the top and 8 ft. high. Its introduction increased air flow from 245,000 to 280,000 cu.ft. per minute—over 14 per cent—showing how large a loss can be incurred in a short length of roadway where air is traveling at speed. But, as this wood construction introduces a fire hazard, of which no

Fig. 4—Present method of removing pillars—by cut-overs



one is more conscious than the management, the pyramid will be made with steel plates, which already have been ordered.

As the batteries in the motor barn, repair shop and charging rooms generate explosive gas, care has been taken to give to each a separate split of air which is carried by pipes at the rear of each of these rooms direct to the return.

Both flame safety lamps and electric cap lamps are provided for all bosses, firebosses, shotfirers and cutters, 62 in all of the former type of lamp being in use. Others carry electric safety lamps, of which there are 600, 471 being actually in use.

Permissible powder of glycerine dynamite type is used for shooting with three shots drilled under the cannel roof in advancing rooms. The center hole, which is loaded with 2½ or more cartridges, is fired first and then the two side holes, which are charged each with 2½ or less cartridges, each cartridge containing 4.38 oz. of explosive. No. 6 caps are used as detonators with 8-ft. lead wires wound on a spool for each shot. Formerly, an additional shot was placed under the middle parting, but the more simple method of shooting seems to give the desired effect. As none of the coal from this mine goes on the market, but all is used at the West Penn power plant adjacent, where the coal is crushed for use on underfeed stokers, little is gained by methods that would break the coal less.

Miners drill their own shotholes and carry in their own cartridges in wood boxes, but shotfirers, of whom there are nine, load the holes and carry the detonators and batteries by which the shots are fired. The cars by which the miners are hauled into the mine with their cartridges are special wagons with wood seats, plain—not swivel—couplings and an insulated coupling between first car and locomotive. With plain couplings the cars are less likely to overturn in case of derailment than with swivels. These cars are switched into a sidetrack, where they await the end of the shift. When the time comes for the men to leave the mine they enter the cars and wait till the locomotive is coupled to the trip and they are hauled out. So there is no unseemly haste and possible accident.

All cartridges are stemmed to the mouth of the hole with clay dummies. These are not put into paper receptacles, for by a strict adherence to the letter these are held not to be permissible under the terms of the Pennsylvania mining law, because paper is not incombustible. The clay is wetted, worked into sausage-like dummies by the miner, presented to the shotfirer in the bowl of a shovel held near the face and rammed into the hole with a wooden tamping bar. All shots are fired by batteries. Before firing, tests are made for gas with the flame safety lamp. Shotfirers, as

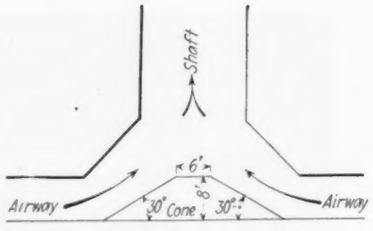


Fig. 6—Deflector pyramid at base of air shaft

stated, carry both flame and electric safety lamps.

All coal is cut to a depth of 7 ft. over the bands in the bottom of the coal by permissible longwall undercutters having cutter bars 7½ ft. long. Permissible equipment, to be safe, must be diligently inspected. With feeler gages the widths of clearances, through which any gases exploding in interior chambers can escape to the exterior of the machine, are tested so that they may be kept within the required limits and so that gases as they emerge will be cooled by the metal surfaces to a temperature well below the ignition point. Inspection also is made to see that no bolts are omitted or loose, because should the clearances be wide enough for the emission of over-hot gas, or should they become wide enough by reason of internal pressures and insecure retention by bolts inadequately tightened to pass such overhot gas flames, the methane in the working place may be ignited. Flames also may pass through an unoccupied bolt hole.

Six-ton storage-battery locomotives, some having 80 cells and some 74, bring loaded cars to partings in the butt-entry headings, whence they are taken by 8-ton trolley locomotives along the "flat-road" or face entries to the main butt roads; here main-line 15-ton locomotives, of which there are six, haul the loads to the revolving dump at the shaft. Gliders are used, instead of trolley wheels, on all six locomotives; these were provided the motormen on their request after the first one had been installed. Not only do they furnish the power required for locomotive operation with reduced resistance, because of their lengthened contact, but they follow the wire and switches with less frequent dewirement, make no sparks and make back-poling impossible. Some of the gliders, at the suggestion of Arthur Hall, mine superintendent, are inset with Meehanite, this metal containing graphite, which gives good conductance and a smooth contact. It has been found that with any kind of contactor, when the trolley wire is oiled, sparking is reduced or eliminated.

Trouble and accidents, one resulting in a broken back, have resulted from motors breaking loose from their suspensions from failure of suspension bars, bolts or springs. Motors may be thrust up against cover plates or may fall to the track. Close inspection may or may not anticipate such defects with repairs. So a safety device, consisting of a strong suspension crossbar joining the frame on either side and bolted thereto, has been provided for each motor. This bar has bolts and chains attached to the casing frame of the motor which will prevent the motor from falling to the track. It also has a buffer block that will hold the motor should it swing in the opposite direction.

Probably the motorman will be cognizant should the regular suspension bar, bolts or springs fail, but even if he should not be, no damage would result. The locomotive still can be run out to the repair pit with the motors hanging on the emergency suspension bar. This safety equipment is shown in Fig. 7.

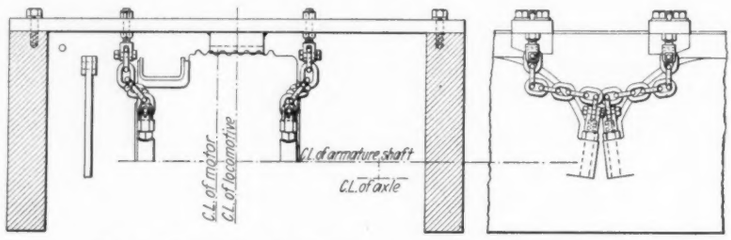


Fig. 7—Suspension bar keeps motors from falling to track

Locomotives were formerly repaired at the main shop on the surface, but it was found that when one got out of order it was not convenient to send it to the shop till the end of the week, so it was patched up and made to operate as best it might, which meant that it gave inefficient service and developed in the interim further disquieting and expensive symptoms. Moreover, hoisting a heavy locomotive up the man-and-material slope was not a wholly safe performance for frequent repetition. For this reason a repair pit was provided inside the mine so that the locomotive can go to the doctor promptly whenever ills develop.

Cars are of two types, a riveted steel car of 100-cu.ft. capacity with plain bearings and 18-in. wheels and a welded steel car of 123-cu.ft. capacity having rolled edges and roller bearings with 14-in. wheels. In neither car is the bottom molded around the wheels to give additional width. The track gage is 44 in. As the car supply is at all times ade-

quate and no effort is made to induce the miners to build up their coal, the cars are not topped to any extent. As a result, with straight, strong tracks, good switches and solid-bottom cars, the track always is clean. The new cars are entirely smooth on their exteriors, and so cannot catch anyone as they pass along the road.

Even the miners' check hook is a missing menace. Two holes are drilled close to each other through the front of every car. Through one of these is passed a lead wire from an exploder, of which there are many in every room. This engages two holes in the miner's check. The wire is then passed through the other hole and the two ends are twisted firmly, holding the check immovably. At the weigh scales the check is broken loose with a pry. A miner, if he will, can remove the check from another miner's car, but with this arrangement all he would have would be a valueless disk of metal, for with this arrangement he could not replace the stolen check with his own without first emptying the car, because the check holes are placed near the car bottom. So at this mine no one "steals cars," and there is no risk of lacerations or entanglements with check hooks.

In most cars the brake blocks are set so as to push the wheels away from each other, thus distorting the car and increasing the wheelbase. Cars at this mine have a brake that presses on the tops of the wheels and thus avoids that defect (see Fig. 9). On the dump, which revolves through 360 deg. and dumps two cars at a time, a certain longitudinal strain is kept on the couplings so that the pins of the swivels will not drop out. The cars, being of two types having wheels differing in diameters by 4 in., would not locate themselves properly in the dump with a fixed stop at its entrance if it were not that provision has been made by which the wheelbase of the truck having the small wheels is 4 in. more than the wheelbase of the truck having the larger wheels. This corrects for the difference in diameter, and dumping of cars now of one type and now of another proceeds without difficulty.

In the main headings (which are driven on the butt) and in the face or "flat" headings, 60-lb. rail is used, set mainly on wood ties laid at 20-in. centers. In the room headings, 40-lb. rail also is set on wood ties with 24- to 30-in. centers, but steel ties are used at the points of switches and for a foot or more beyond the frog to assure perfect gage. In the rooms, 30-lb. rail is provided with steel ties set at 3-ft. centers. All switches are factory-made. Those at room mouths have No. 1½ frogs, and all others are No. 3 frogs. On the main haulage, frogs are plated or of manganese steel.

Dispatching of trips with a block-signal system is another safety provision, but it has an even greater advantage in increased efficiency. Trip size is carefully regulated. Storage-battery locomotives pull one or two cars at a time from each working face, the lighter trolley locomotives pull 14 to 15 cars to a trip and the main trips behind the heavy trolley locomotives are limited to 28 cars.

The double air doors in the tunnels are mechanically operated by the passing trips and are set 600 to 700 ft. apart, so that one pair of doors is closed before the other is opened. To assure that the cars will be on the track on approaching the doors, rerailing devices are permanently installed. In all rooms safety blocks are provided to prevent cars from running away and pinning men between the face and the end of the car.

To prevent the man car at the head of the man-and-material hoist from getting away and running down the incline a solenoid-operated switch, normally open, is provided at the loading point. When the switch is open a green light is shown inside the hoist house. When the hoistman lets the car down the slope, he throws this switch by a movement of his foot on a pedal and a red light is shown.

The tracks have recently been connected with short U-bolt 4/0 welded bonds placed under rails, this being made possible by the fact that all rail joints are placed over a gap between ties instead of resting on a tie. The old side bonds, which passed from rail to rail around the fishplates and which were good practice when installed, are still in place in most instances, and they help also to decrease resistance. Not only, however, are they longer and therefore more resistant to the passage of current than the shorter U-bonds but the flanges of the wheels have cut them in places and any derailments are likely to tear them loose. The short U-bond is down under the rail where it is well protected from all forms of abuse. The U-bond costs 42c. as material and 86c. to install, making a total cost of $1.28, whereas the old bond cost 88c. and 58c. to install, the total cost being $1.46. The welded U-bond will give about half the resistance of the old pressed bond with good work in each instance. Since the U-bonds were installed, armature and field failures have decreased considerably and an electrical saving of $350 per month has been made. Cross bonds are provided at 200-ft. intervals. On the room headings, however, to avoid igniting gas, no welding is done. Pressed 2/0 bonds are used to connect the rails.

Direct-current potential is 250 volts. This is provided at two substations, one on the surface and one underground at the 11th butt. From the first substation to the slope bottom, a distance of 650 ft., the direct current is carried by one 1,000,000-circ.mil, one 750,000-circ.mil and one 500,000-circ.mil cable. From that point to the 11th butt intersection is installed one 1,000,000-circ.mil cable, two 500,000-circ.mil cables and two trolley lines totalling 423,000 circ.mils. All these feeders are positive. To the underground substation is carried a 3-conductor, 2,300-a.c. cable, 5,000 ft. long, buried 2 ft. deep in the clay floor. At the working faces the purpose is to maintain at least 200 volts under load. Should this fail to be provided, cables of sufficient capacity are added to assure that this voltage will be maintained.

From the bottom of the man-and-material slope to the substation on the

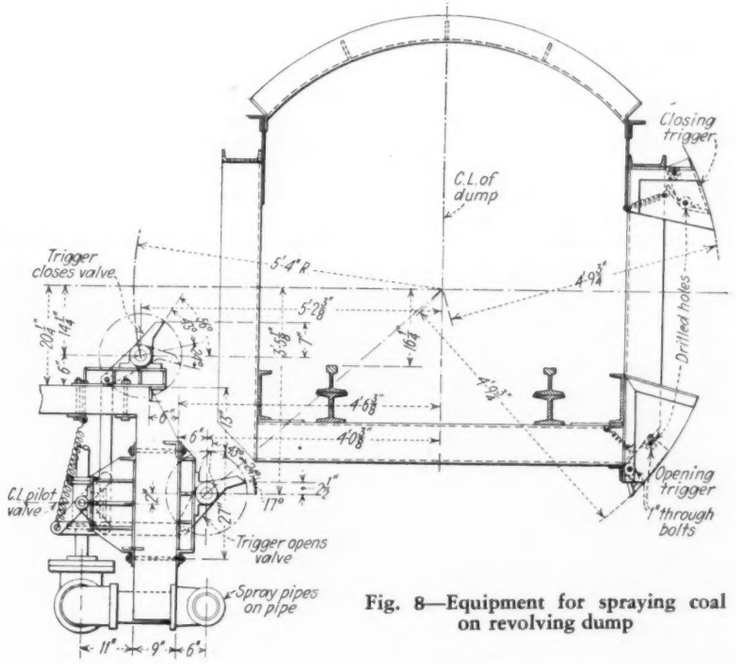


Fig. 8—Equipment for spraying coal on revolving dump

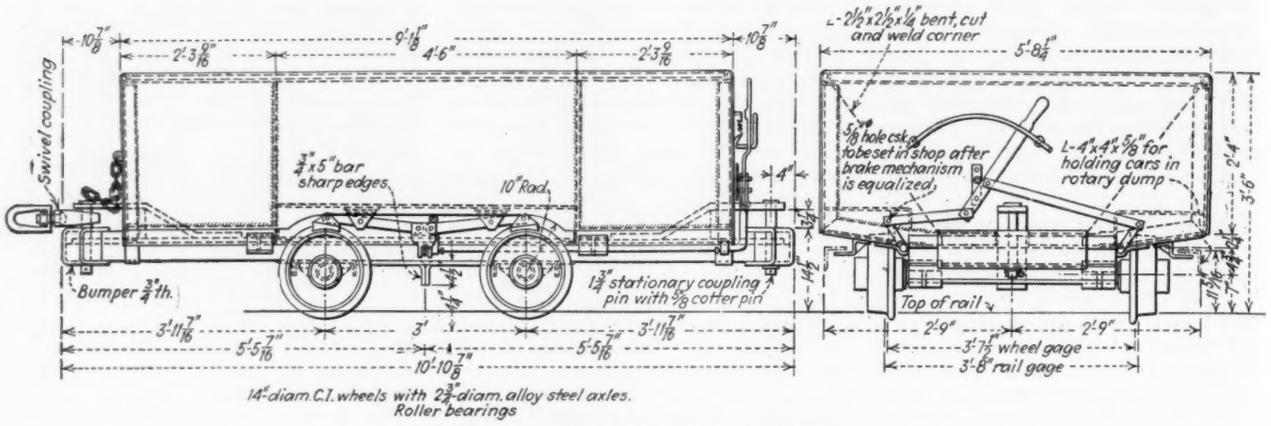


Fig. 9—Mine car showing brake mechanism

surface the return current is carried by one 1,000,000-circ.mil cable, one 500,000-circ.mil cable and the two 60-lb. rails. The return current from the four 60-lb. rails of the haulage system is carried to the underground substation by a 1,000,000-circ.mil cable. The mine uses 390,000 kw.-hr. per month, or 5.7 kw.-hr. per ton. Its installed substation capacity is 960 kw.

Electric lights are provided at all switches and other important points. Great care is taken to ground these carefully, passing the return current down to the floor by a ground wire fastened to the heading rib. This wire is buried in the floor and passed toward the rail, where it is clamped firmly to an electric bond in the haulage track. All machinery, portable as well as stationary, is well grounded, and rubber mats are provided at all switches, on which the operative must stand. In most permanent installations these mats rest on stools a few inches high which lift the operative clear of the ground and make shock impossible. All metal-cased telephones are grounded as meticulously as machines.

In each substation, rubber and leather gloves are provided, to be used when pulling switches and disconnects on high-tension lines. These gloves are tested every three months by the West Penn Power Co. to see that they maintain the required resistance. New moisture-proof telephone cables are being installed which will not be buried but hung from the roof. All pumps are being equipped with starters. Gears also are guarded. In the repair-pit shop all tools will be kept in a recess to be covered with a steel door, and another recess similarly guarded will house the welding equipment.

Rock-dusting is being more aggressively practiced at this mine as the years pass. Not only will self-tripping barriers give place to general rock-dusting of returns but more dust is being used on traveling roadways and rooms than before. Whereas in previous years 30 tons sufficed per month, in the first six months of the present year 50 tons monthly has thus been used. Rock-dust men wear respirators and one certified man in the rock-dust distributing crew of three enters each place ahead of the machine to test for gas.

Though a blast of return air from the smaller of the two fans enters the pit over which the revolving dump operates, sweeps over the chute down which the coal slides and carries the dust up the shaft to the surface, it is thought well to wet the coal down on the dump with sprays. The revolving dump makes a complete revolution in 8 seconds, but on only a fourth of the revolution is the coal discharged. So water is needed only for 2 seconds, but so much water is required that only a 6-in. line can supply it.

A 6-in. valve is difficult to open and close for so short a period with the necessary promptitude, so a 2-in. valve operated by the motion of the dump is mounted above the 6-in. valve to provide water that pressing on the gate of this large valve will open it wide. Only enough water to bring the quantity up to 4 per cent is used, and this percentage is helpful rather than detrimental in the operation of the West Penn underfeed stokers on which the coal is consumed. The movement of one projection of the revolving dump opens the 2-in. valve, which the motion of another projection closes (see Fig. 8).

Possibilities of fire are carefully watched. All accumulations of refuse are duly avoided. In the repair-pit shop below ground nothing but the work bench is of wood, and this is so heavy as to be slow-burning. All charging rooms, pumprooms, substations, etc., are made of incombustible material and fitted with steel doors. Certified men inspect the mine on idle days lest an electrical fire start in the cannel roof. On other days the men at work would report the condition and extinguish the fire. A 200-gal. Foamite-Fire Foam car is kept at the mine bottom and is maintained in condition by the machine boss at the locomotive repair shop. A 2½-gal. tank of the same type is hung at the entrance to each butt entry and a 1-qt. Pyrene fire-fighting equipment is carried on every locomotive and mining machine. Surface buildings also have 2½-gal. tanks, and fire plugs around the property complete this protection.

Safety hats, safety shoes and goggles are not mandatory, but their use is encouraged, and all are quite generally used and kept in stock at the mines. Some of the miners are using respirators. Men grinding at the emery and Carborundum wheels are required to wear goggles, and a glass plate further protects them at work. Adhering grains of abrasive dust on the underside of the plate glass testify forcibly to the needfulness of its protective presence.

Five McCaa breathing apparatus recently have been installed in place of older equipment. A carbon-monoxide detector of new design has been provided for use in case of a mine fire. At the mouth of every room heading a rescue chamber with a small 4x4-ft. opening and about 100 ft. long, barely heading width, has been excavated in the 205-ft. flanking pillar of the adjacent face entry and running parallel thereto. The opening can be blocked with a door by the beleaguered miners, this door being stored in the chamber, the capacity of which is increased by driving two short "necks" on each side, those driven toward the face entry having two small easily blocked holes which lead into the return. Bulletin boards are placed in various places around the mine with posters provided by the West Penn Power Co. All miners are checked into and out of the mines.

Meetings of foremen are held every month to discuss accidents occurring during the preceding period and means of avoiding similar accidents. They study the reports of the safety engineer, R. E. Jones, on dangerous conditions and their correction, also violations of safety practice observed by him and his assistants in making their rounds of the property. No safety meetings of employees are held, as it is found that such meetings have not resulted in any betterment of conditions.

(Concluded on page 461)

AERO-MECHANICS

+ Sheds New Light

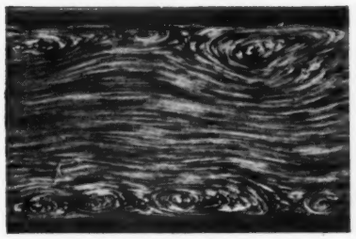
On Ventilation of Mines

By A. L. BARRETT
Pittsburgh Coal Co.
Library, Pa.

IN EARLY studies of the flow of fluids in pipes and channels each investigator deduced from his experiments his own pressure-drop, or resistance, formula. As a result a number were proposed to explain and predict friction pressure and friction losses. Several of these formulas have been used at one time or another for the calculation of the friction pressure encountered in mine ventilation ducts. At the present time the formula in most general use is a variation of Chezy's original pressure-drop formula,

$$R = \frac{K L O V^2}{A}$$

in which R is the pressure drop in pounds per square foot, K is a friction coefficient, L is the length of the duct in feet, O is the perimeter of the duct in feet, V is the air velocity in feet per minute, and A is the cross-sectional area of the duct in square feet. This formula accurately expresses the variation in pressure for a given duct when the velocity is varied. It is not so satisfactory, however, in explaining resistance variation with changing duct conditions. Variation of wall roughness makes necessary considerable adjustment in the value of K if this formula is to hold.



Courtesy United Engineering Trustees, Inc.
Fig. 1—Turbulent flow along a straight pipe

Resistance to flow of air through a duct is commonly believed to be wholly caused by actual rubbing of the fluid or air on the walls of the duct. This conception of air friction is incorrect. Less than ten per cent of a given resistance loss arises from wall friction, the rest being due to turbulent flow.

When air travels through a mine entry at very low speed, the air particles move regularly in paths paralleling the walls of the entry. This type of flow is termed "laminar." If the velocity exceeds about 5 ft. per minute, which includes all practical mine-ventilation velocities, irregular secondary motions are introduced in directions perpendicular to the axis of the entry. The condition representing turbulent flow is shown in Fig. 1*. The limiting velocity between laminar and turbulent flow is determined by the Reynolds number which is a function of the duct size, the kinematic viscosity, and the air velocity, but the value given applies to average mine entries, and all mine ventilating currents will be turbulent. Even in a perfectly smooth aircourse this turbulence cannot be avoided. However, additional turbulence is caused by roughness, obstructions, turns and rapid changes in cross-sectional area, and this turbulence can be reduced, as will be shown.

A study of the flow conditions around an obstruction explains the causes of the two types of flow, as well as the change in the magnitude of K in Chezy's formula with a modification in duct surface. When flow is just starting from zero velocity around a blunt body, a purely laminar flow results, as in Fig. 2. All particles of the air are in motion

*Figs. 1-6 are from "Applied Hydro- and Aero-Mechanics," by O. G. Tientjens, published by McGraw-Hill Book Co.

Fig. 2—**Flow just started from left to right around a blunt body. Flow is almost entirely laminar**
Courtesy United Engineering Trustees, Inc.

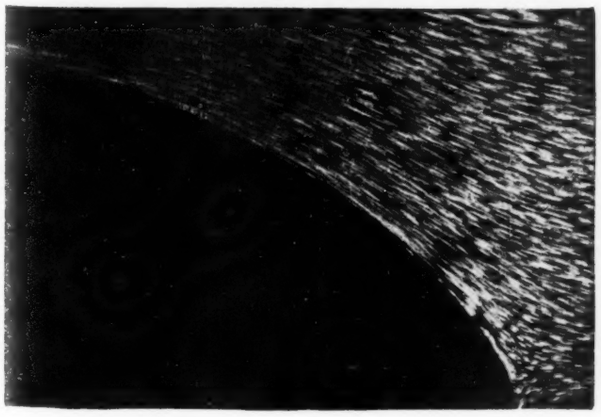
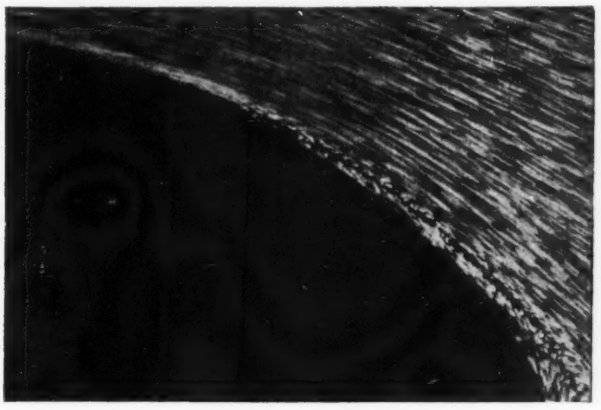
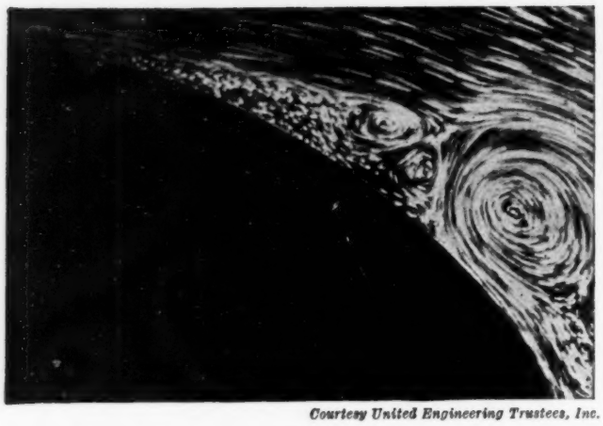


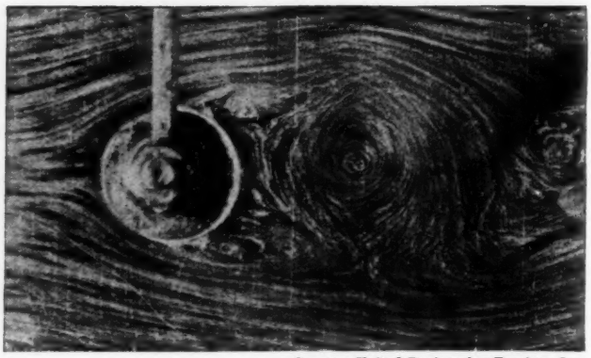
Fig. 3—**Still flowing from left to right but turbulence has started on right**
Courtesy United Engineering Trustees, Inc.





Courtesy United Engineering Trustees, Inc.

Fig. 4—Turbulence has reached a further stage



Courtesy United Engineering Trustees, Inc.

Fig. 5—Turbulence behind an object of cylindrical cross-section such as a mine prop

except perhaps a few at microscopic distances from the surface. Because the air is expanding behind the blunt body its velocity decreases and pressure increases in the direction of flow. Immediately after flow starts, the particles of air in the layer bounding on the body lose all their kinetic energy because they are slowed down not only by the pressure gradient but also by the friction of these particles on the surface of the body.

These particles, after coming to rest, still are subject to the pressure gradient of the flow around the object; that is, the pressure on the particles that have lost their kinetic energy is acting in a direction opposite to the direction of flow. These particles immediately start to move backward, as is illustrated by Fig. 3. The dots near the surface indicate stationary particles, and the motion of the particles between this boundary layer and the body is from right to left, a direction opposite to the flow of the main body of air. The progression of this phenomenon is shown in Figs. 2, 3 and 4. It can be seen that the boundary layer moves out to some position approaching an expansion angle of 7 deg. and that the dividing line between the forward and backward velocities is unstable, constantly forming new and separate vortices, or eddies, which break away and get into the main body of flow in the channel. This formation of vortices is undesirable, for it dissipates energy and changes the shape of the flow around the blunt body so completely that only a small part of the kinetic energy of the air is recovered as it expands and slows down behind the body. Under such conditions almost all the energy is lost, not by wall friction but by the energy losses of vortices, which may involve practically all the air in the channel.

This back-flowing boundary layer of air, constantly sending vortices into the main body of flow, exists behind each projection in a mine entry, including every grain of sand, every piece of coal or slate protruding from the rib, every post in the entry, as well as behind such major projections as overcasts and falls of slate or coal. The forward portion of these blunt bodies introduces a very small energy loss. This is most easily explained by reference to Figs. 5 and 6, which are reproductions of photographed flow conditions around a cylinder (which might be a post) and a flat object. It is significant that there is no turbulence on the upstream side of either of these objects. These photographs furnish an excellent visual indication of the fact that the upstream losses of any obstruction are negligible in comparison to the downstream losses. Practically all the pressure drop in a mine ventilating system is the result of vortices set up in the rear of blunt bodies, great and small. Variations in the number and size of obstructions in the aircourse will therefore require changes in the value of K used in Chezy's formula. Though the energy loss introduced by any given body in the air channel is easily computed, it is an impossible task to attempt any such calculation for a mine entry, because of the almost infinite variation in size, shape and location of the objects which make up the boundaries and contents of the entry. Fortunately, for purposes of calculation, all these individual losses vary as the square of the air velocity, and the total loss can be obtained accurately from the formula given in the first paragraph of this article if we can choose the proper value of K.

Ventilating pressure and cost may be reduced if the preceding principles are used in improving the mine airways in regions of high velocity. It would be impracticable to make improvements where the velocity is low. A velocity of 1,000 ft. per minute might be chosen as a lower limit. The downstream parts of projections of stone or coal should be tapered back to the wall at an angle of 20 deg. or less if possible. Losses introduced by such objects would not be eliminated, but they might be reduced as much as 50 per cent. The upstream corners of crosscuts, manholes and other rapid enlargements of the airway should be tapered off in the same manner because in such cases the air expands with formation of vortices at the upstream corner. By lining timbered shafts and entries, pressure losses induced by the timbers are greatly reduced. All improvements projected should be considered from an economic point of view, potential savings being balanced against cost.

Airway falls are obstructions similar to that illustrated in Fig. 4, and similar turbulence and pressure losses are set up on their downstream sides. The pressure drop may be most inexpensively reduced by tapering out the downstream part of the fall while leaving the upstream part undisturbed. This is particularly effective in view of the fact that there will be a hole and an area of expansion just over the fall. Fig. 7 indicates alterations to a fall for greatest reduction in pressure loss. The same sort of reasoning may be applied in improving the efficiency of an overcast. As most of the losses occur in the expansion area, which usually is the downstream side of the overcast, that is where most of the filling should be done. It is doubtful whether more than a slight corner filling is worth while on the upstream side. If gradual expansion is provided, greatly reduced overcast area may be used without introducing appreciable pressure losses. Fig. 8 is a suggestion for a practical overcast design. When an aircourse is turned, the stopping should be placed immediately at the turn rather than some distance beyond it. Filling in the outer corner of the turn will improve the efficiency, but rounding off the inner corner would increase the expansion area and would be detrimental.

Some principles to be remembered in any alterations of the mine air ducts are as follows: Pressure losses occur chiefly at the downstream side of any obstruction due to the formation of vortices where the air expands too rapidly, whereas losses are comparatively negligible in the contraction of the air as at the upstream side of an obstruction. Tapering off the downstream side of

any projection is the best method for minimizing such losses. Airway improvements will be most effective where the velocities are the highest, as the pressure drop varies as the square of the velocity. No improvements on airways should be made on splits controlled by a regulator, as the regulator opening will have to be reduced if the air resistance is decreased.

Reduction of velocity in ventilating ducts is a more effective means of reducing the ventilating pressure and cost than any of the measures already mentioned, for the pressure loss varies directly with the number and size of the free vortices in the air stream, while it varies as the square of the velocity. When a mine is laid out, adequate duct area should be provided to keep the velocity below 1,000 ft. per minute in all entries for the life of the mine. A reasonable power expenditure necessary to force air at a velocity of 1,000 ft. per minute through 1,000 ft. of a typical Pennsylvania mine airway is $404 per year. This figure is based upon an airway 5x10 ft. having $5x10^{-9}$ as the friction coefficient K, power costing one cent per kilowatt-hour, over-all fan efficiency 72.5 per cent and on continuous operation. If the velocity through this same airway were increased to 1,200 ft. per minute, the cost would be $700 per year. If the velocity were 2,000 ft. per minute, the cost would be $3,230 per year. Increasing the cross-sectional area of a high-velocity airway is one means of reducing velocity. If a 5x10-ft. entry, carrying air at a velocity of 1,200 ft. per minute, were widened to a 5x12-ft. entry, the velocity would be decreased to 1,000 ft. per minute for the same quantity of air and the cost for power per 1,000 ft. of entry would be reduced from $700 to $458 per year. Evidently it pays to keep air velocity as low as possible.

In planning to lower velocities in the main airways, attention must be given to the correct splitting of air. In the past thirty-five years there has been a marked trend away from the use of long splits. In some cases this has been carried too far. When the volume of gas produced or the number of men involved is not too large, it is, in many cases, excellent practice to make one split out of two. The saving in volume thus effected frequently reduces the pressure drop in the main airways more than the split pressure is increased. For example, at one mine placing two splits in series would reduce the total mine pressure 0.3 in., reduce the total volume 13,000 cu.ft. per minute and save in power $655 per year.

Leakage from intake entries to return entries is responsible for a large part of the power loss in the average mine ventilation system. In average practice 50 to 60 per cent of the air entering a mine never reaches the face but leaks through doors, walls, stoppings and overcasts to the return airways. Even in what is called good practice 30 to 40 per cent of the intake air never reaches the point of use but leaks to the returns. As the quantity of air required at the face is the controlling factor in determining the quantity furnished by the fan, leakage means extra air carried in the main airways. Power loss varies as the cube of the volume of air passed through an entry, so addition of the leakage volume to entries already carrying large volumes of air causes a large increase in power cost over what it would be if the leakage did not exist. If only 40 per cent of the air carried by an entry represents leakage, the power used in this entry would be lowered 78 per cent if leaks were eliminated. In many mines the total power consumption for ventilation would be reduced 50 to 70 per cent if all leakage were prevented. Air leaks near the face are frequently overlooked, because the pressure difference between the intake and return is low, but they are, nevertheless, most important, as they add to the pressure loss in all the entries traversed between the leak and the fan.

A study of the pressure distribution throughout a mine ventilating system is necessary if the problem of reducing ventilating cost is to be intelligently attacked. Such a study also gives a perspective of the pressure-loss problem, which is helpful in the planning of ventilation systems. Altimeter surveys made at three large mines indicate a pressure loss distribution as shown in Table I. These mines used exhaust fans.

Fig. 6—Turbulence behind an elliptical or flat object

Courtesy United Engineering Trustees, Inc.

Table I—Distribution of Mine Ventilation Pressure Drops

	Percentage of Total Pressure		
	Mine 1	Mine 2	Mine 3
Pressure lost in returns within 1,500 ft. of fan	34	30	40
Pressure lost in returns within 4,000 ft. of fan	60	47	65
Total pressure lost in returns	71	64	76
Total pressure lost in splits	12	7	10
Total pressure lost in intakes	17	29	14
Length of open split from fan to intake (feet)	24,500	18,400	22,000

Table I indicates that more than half the pressure loss is in the return airways near the fan, that three-fourths of the pressure loss is in the return airway and that intake losses are very low. The return and intake airways are of almost equal length in Mines 2 and 3, Table I. As these percentages apply generally to most mines, usually it is not economical to put down an intake shaft for ventilation purposes.

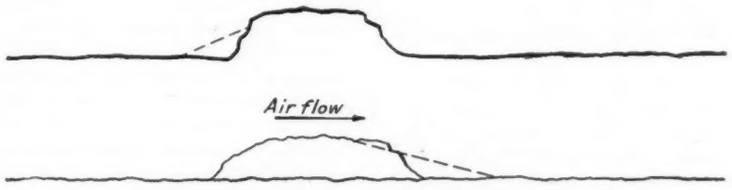


Fig. 7—Hollow made by roof fall should be slanted on the upstream end

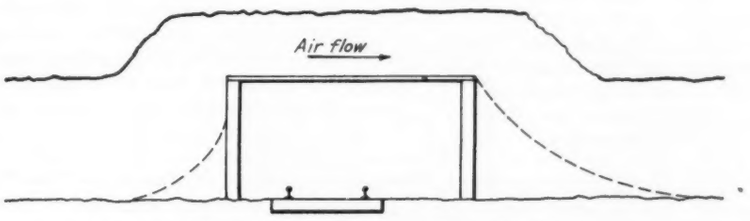


Fig. 8—Little gained by fill on upstream side of overcast but downstream side should be filled

INDUSTRIAL RELATIONS

+ A Fertile Field for Constructive Programs

To Increase Efficiency and Improve Morale

SINCE FREE MAN first began to work in groups for a single employer, sound labor relationships have been vital to successful management. Nowhere has this been more true than in mining, where direct labor is so large a part of the production cost. New union relationships in many districts and increasing public emphasis on the social aspects of industry give the subject added significance. No punches were pulled when F. A. Krafft and Carel Robinson discussed this thorny topic before the West Virginia Coal Mining Institute last month. Some of their verbal blows may be resented, but every coal man interested in problems of industrial relations—and who isn't?—will find their presentation both stimulating and helpful.

1—What an Organized Department Can Do*

By F. A KRAFFT

Director of Employee Service, Consolidation Coal Co. Fairmont, W. Va.

MACHINERY, methods, money and men—the four M's—are just as essential to success in industry as the three R's in education. In the past, too large a part of the industry has focused its primary attention on the first three M's. Now, whether we like it or not, legislation—such as the Guffey, Wagner, Unemployment and Social Security measures—is compelling the coal industry to give the same consideration to problems in human or employee relationships as it does to problems of production, sales, finance and administration.

What is meant by industrial relations? Is it a vague, mysterious, sugar-coated palliative to cover up a clouded record of paternalism, exploitation, general dissatisfaction and discontent? No! Industrial relations in its more advanced interpretation cannot be identified with such negative factors, but can be considered an integral part of industry or general company policy only when associated with good working and living conditions, fair wages, earnings adequate to maintain decent living standards, and the proper understanding and mutual confidence between employer and employee which promotes cooperation and efficient effort and in time makes for successful management and satisfactory relations between management and men.

Employee relations should naturally suggest "good will." The president of a large wholesale clothing firm employing nearly 7,000 workers in the halcyon days of 1919-1920, when asked to explain how an item of $1,000,000 listed for "good will" in the firm's assets had been calculated, replied: "In lower production costs, increased personal efficiency, reduction of wasted raw material and pride of workmanship, we consider that every one of our employees is worth at least $150 a year to us."

Why shouldn't a mine foreman or superintendent calculate the good will of his loaders, cutters, motormen, trackmen and other day labor in the form of dollars and cents? Why shouldn't it count as an asset? None of us need go any further than our own personal experience to argue convincingly that employee good will pays tangible dividends. If this good will prevails among the major and minor executives and among the supervisory force, why is it not logical to expect that this same good will can be reflected up from the ranks if the employees individually and collectively are given fair and reasonable consideration on all questions involving employee or human relationships?

With the advent of the United Mine Workers, some employers and operating men have taken the position that the contract with the union has automatically and effectively erected a barrier between the employer and his men—which in effect is to say that your employees are no longer your employees because they are now members of the United Mine Workers and primarily owe their allegiance to the union. Nothing could be further from the practical truth and we doubt if the union leaders would subscribe to or preach such fallacies to their members. Let us not forget that *our* employees are still *our* employees regardless of their labor affiliations and still have every right to expect us as employers to subscribe to and practice the golden rule of industry: the square deal to all, favors to none.

Regardless of legislative changes and union contracts, the bituminous coal industry owes it to itself, to some 400,000 miners and their families, and to the public, to make a sincere and concerted effort to place industrial or employee relationships on a higher plane than has heretofore existed in a greater part of the industry and on a parity with relationships existing in other basic industries. To do otherwise is to run counterwise to the clock of industrial progress.

*Abstract of an address entitled "The Possibilities of Industrial Relations in the Bituminous Coal Industry," before the 28th annual meeting of the West Virginia Coal Mining Institute, Beckley, W. Va., Oct. 4, 1935.

How can we establish satisfactory employer relationships? How can we perpetuate such relations if they already exist? In an industry as far flung as this one, it is difficult to prescribe a specific over-all program which will meet every need of every company. But the history of our own company, with respect to its industrial relations activities should be suggestive of what can be accomplished.

Prior to June, 1926, the Consolidation Coal Co. had neither an organized industrial relations program nor department. A department known as the employees relationship department functioned to the extent of publishing a company magazine, supervising recreation buildings, supervising the activities of visiting nurses, recruiting labor and preparing statistics on work time, labor turnover, and absenteeism for the operating department. Under this set-up it had been the practice, particularly during shortages of mine labor, to recruit such labor from large industrial centers. The cost of this labor policy in 1926, including transportation charges, agents' fees, charged off debit balances and supplies for recruited labor, amounted to $114,791 in one division where it required the hiring of nearly 10,000 men to maintain a working force of 3,000.

This condition in one operating division and other problems which were difficult of solution under the existing organizational set-up prompted the higher officials of our company to organize an industrial relations department. Decision also was made to coordinate a number of activities which heretofore had been handled locally in divisions and to place them under the direct supervision and control of the director of industrial relations at Fairmont.

Following an extended survey of all our properties and communities, a personnel and employment office in charge of a personnel manager especially trained and selected was installed in each operating division. Duties and functions of the personnel manager were prescribed as follows:

1. To act as a buffer between management and men in relieving the division manager and superintendents of many of the petty details arising out of complex labor relations which in the past absorbed much of the time of these operating officials.

2. To assist the management in the investigation and adjustment of complaints affecting employer and employee relations and involving: (a) working conditions, (b) wages, (c) living conditions, (d) stores complaints, (e) medical and nursing complaints, (f) complaints alleging payroll errors, (g) compensation cases, (h) miscellaneous grievances.

3. To assist the local operating management in: (a) supervision of boarding houses; (b) elimination of undesirable workers and citizens; (c) efficient recruiting and proper placement of labor; (d) follow-up of labor as to earnings, satisfactory living conditions, etc.; (e) general supervision of community activities (social, athletic, educational and religious); (f) reduction of labor turnover; (g) reduction of absenteeism; (h) maintenance of the necessary employee records incidental to employment, discharge, lay-off, reemployment, discipline, etc.

4. Projection and administration of group insurance and the adjustment and settlement, subject to supervision from the central office at Fairmont, of life, accident and health claims under this plan.

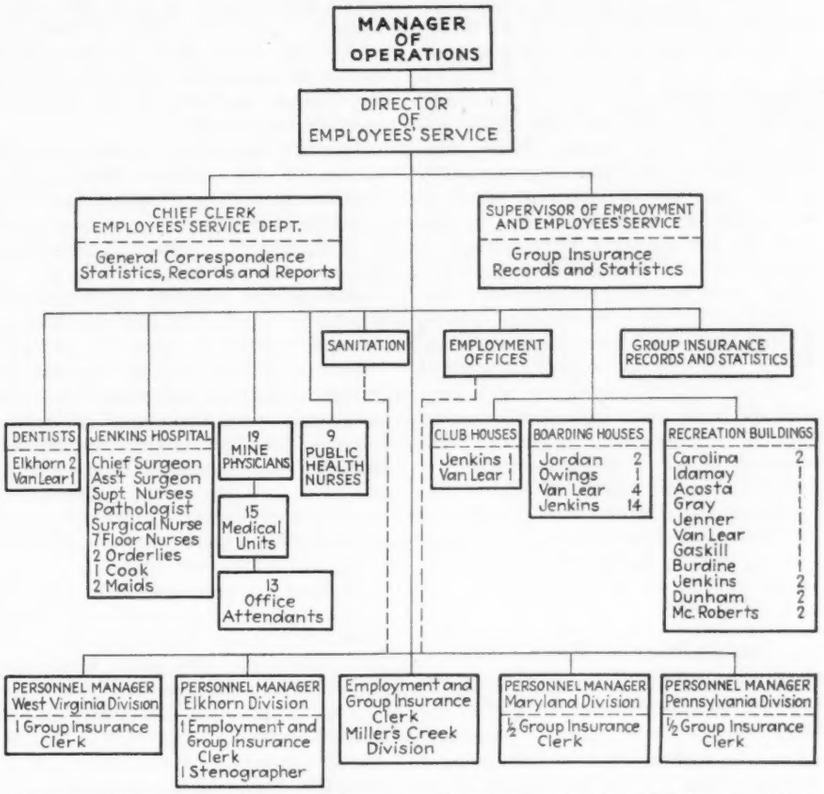


Fig. 1—Organization chart: employees' service department, Consolidation Coal Co.

When the program was launched, 90 per cent of our medical staff was made up of contract doctors—i.e., independent doctors who served our various mining communities for the check-off paid to them over the payroll by our employees. There was such general dissatisfaction with this plan that, at the request of our employees in several divisions, we reorganized our program, continuing in employment such contract doctors whose services were satisfactory and desired to remain under the reorganized plan, and whose ideals as to service to the employees were in keeping with the ideals of the program. We immediately developed a plan where young doctors who had been graduated from recognized medical schools and who had served interneships of at least two years were assigned to the task of keeping the miner and his family well. Benefits of the reorganized plan began to assert themselves immediately.

Following the inauguration of our medical program and the installation of full-time salaried doctors, a standard list of 132 drugs for all of our medical units was adopted. By centralized and concentrated purchasing in wholesale lots six times per year, we were able to save approximately $10,000 in the first year under the new plan. Physical layout, physical and technical equipment of the offices, and the general procedure of our medical units also have been standardized so that today every one of our medical units rates far above the average in appearance, equipment, etc.

As shown in Fig. 1, a supervisor of employment and employees' service was placed in direct charge of employment offices, club houses, boarding houses and recreation buildings. In justification of this organizational set-up and in the centralizing of control of this type of activities, note some of the changes and corrections that were developed in various phases of our program. As previously stated, the cost of recruiting of labor in 1926 was $114,791. In 1927 it dropped to $43,176.50, and in 1928, 1929, 1930, and 1931, respectively, this expense was reduced to $37,525.31, $24,857.61, $23,296.75, $6,771.17. In 1932 the cost was only $98.91, and in succeeding years nothing.

This record was accomplished by coordination and cooperation of all departments involved. In place of heavy expenditures for recruiting labor, our employment office was able to build up a labor reservoir of approximately 7,500 names that could be reached by letter, telephone call or personal visit. This made it unnecessary to continue the expensive labor recruiting program or to advertise in the newspapers of the district where labor was required.

A program of physical examination inaugurated at the same time has assisted the operating units in weeding out undesirable employees who, because of

disease or other infirmities, might automatically become liabilities in the matter of accident, compensation and group insurance. In the early years of this examination program it was not uncommon to reject 30 to 35 per cent of the applicants for employment. Today, normal rejection averages approximately 22 per cent, and the physical status of our employees has improved directly with the per-man-day improvement in production. An immunization program, which required all applicants for employment to be immunized against typhoid and smallpox, has been extended until today approximately 95 per cent of our employees and their families have been immunized against typhoid, smallpox and diphtheria. The beneficial results of this program are reflected in higher health standards, improved working morale, and a reduction in absenteeism from an average of 30 per cent in 1926 to an average of approximately 11 per cent for all operating divisions in 1934.

Health Program Saves Lives

The company also conducts a public-health program through our public health nurses. As soon as a new employee is instructed in home hygiene and sanitation, the health program is explained to him by the nurses, and inoculations for the prevention of typhoid, smallpox and diphtheria are started at once. This phase of the program offers the public health nurse an opportunity to develop her contacts for subsequent clinics. These clinics are for prospective mothers, infants and children of pre-school age, chest examinations, orthopedic, eye, ear, nose and throat, dental and other specialized fields. Nearly all children under ten years of age have been protected against diphtheria. There was only one death from diphtheria last year and this was in a child who had not been inoculated. There have been no deaths from typhoid fever within our camps for more than five years and none from smallpox among our employees for seven years.

In addition to the usual routine physical and dental examination, with subsequent follow-up for correction of defects, an organized health education program has been established in the majority of schools serving our communities. This program is enlarged in scope according to grades and incorporates a different health subject for each month of the school year. The work is not only beneficial to the school children but also of considerable value in reaching the parents and others in the family.

Health education classes are confined mainly to teaching the Red Cross course in home hygiene and care of the sick and to classes in first-aid instruction. Individuals completing the home-hygiene course are used extensively for volunteer help in assisting nurses and doctors in school health work, clinics, and even in times of epidemics, such as influenza, where they have been found to be of almost indispensable value in relieving distress and suffering within their respective communities.

Sanitary inspection committees, consisting of the public health nurse, physician and three local officials, make scheduled inspections of our communities, including all houses, public buildings, stores, restaurants, schools, etc. Following the adoption of this inspection plan, considerable improvement was at once noticed in general sanitation. Provision is made for the regular collection of garbage and refuse, and sewage and waste disposal. Regular examination of approximately 250 food handlers also is part of the sanitation program. When these examinations started, they showed 10 per cent of the food handlers were carriers of infections and contagious diseases.

Sanitary inspections have automatically checked the spread of disease originating from flies and filth. The head of our house-plant department frankly admits that the maintenance cost of our house plant has materially decreased because of the improved attitude on the part of our employees, in the pride that they take in maintaining sanitary conditions in their homes and around their premises.

Nurses Make 56,000 Visits

Last year company nurses made 56,000 follow-up visits to the homes, and 7,800 physical defects, mostly dental, nutrition, vision, and nose and throat, were corrected. Organization and development of community clubs, such as Boy and Girl Scouts, parent-teacher associations, civic, farm women and church clubs have been fostered and encouraged. All of these render valuable assistance with community programs, clinics, correction of defects, school-lunch projects, material relief, immunizations, demonstrations and exhibits.

The extent and character of illness and death varies in direct proportion to the effectiveness of our preventive program. Last year, for instance, our death rate was 8 per 1,000 population, while the general average of the United States was approximately 12. The death rate in our communities from tuberculosis has been reduced to one-half of the general experience. Equally gratifying results have been achieved with respect to maternal and infant mortalities, stillbirths and specific diseases.

Under a garden program sponsored and supervised by our department an intensive campaign is carried out to produce the maximum quantity of garden products each summer and in turn to can such products in the fall. In Kentucky, Pennsylvania and West Virginia, state universities have provided technically trained experts to assist our people in the growing and canning of foodstuffs. An average working force of approximately 8,000 employees over a period of six years has averaged in the production and canning of foodstuffs amounts ranging from $280,000 to $375,000 per year.

One of the largest projects developed for the relief of distress is a group insurance plan under which all the direct benefits go to the employee, and one-third of the premium is paid by the company. At the inception of the plan 98 per cent of the employees voluntarily subscribed to it. Today, notwithstanding short work time and generally distressed conditions in the industry, the enrollment is still well over 90 per cent. The policy provides death benefits from $1,000 to $2,000, depending upon the length of service. Any employee with a service record of five years is entitled to the maximum death benefit. It also includes an extension plan to salaried and supervisory groups. In case of illness or injury the employee receives accident and health benefits of $12 per week, with a maximum of thirteen weeks for any one illness or accident.

Rely on Group Insurance

Our records show that only 18 per cent of our families so affected by sickness, injury or death received insurance payments outside this group plan. In six years, group insurance disbursements for death and accident and health benefits have totaled $1,766,108. Without this plan it is obvious that the company in one form or another would have had to aid distressed families in time of death or sickness.

Another activity which has more than paid its way involves the promotion of our recreation buildings. Operation of modern recreation buildings in mining communities of any size is an aid to better labor relations in that they provide an outlet for all forms of recreational, educational and social activities. Moreover, under proper mangement and centralized control, these recreation centers can be operated profitably and at the same time provide service, amusements and merchandise at a lower cost than prevails in the larger industrial areas.

If an industrial relations department cannot justify its expense and existence in tangible values, it should never be organized. Neither should one be organized if it is expected to pursue a rubber-stamp program that covers up a policy of exploitation and sugar-coated philanthropy. An industrial relations program should be sound; it should be operated on the basis of a square deal to all, and be free of frills and anything that does not develop practical and mutual benefit to employer and employee. Furthermore, such a department can operate just as effectively under union conditions as under non-union conditions, as is proved in the case of the well known B. & O. R.R. plan.

An industrial relations program

should not disregard the interests and welfare of the so-called white collar group. This industry can well afford to pattern after many other industrials wherein at least once a year, and irrespective of cost-of-living fluctuations, surveys and analyses of the service records and merits of the clerical and minor supervisory groups are made and promotions or increases in salaries are made a matter of group policy, where consideration of the individual employees justifies such a program. This is only right because this group individually and collectively is equally as important to successful administration as the larger operating or production group.

Any industrial concern employing not less than 2,000 workers has need for a definitely organized industrial relations program headed up by centralized supervision and tied into the operating or manufacturing end of the business. In units employing less workers there is no reason why the operating superintendent or even the mine foreman cannot be trained and educated in progressive industrial relations policies. A superintendent of a small mine or even one single large mine can be just as interested in the human problem of his job as in the production, safety and cost end. Show us a superintendent who ties in men with machinery, methods and money and we will show you a successful mine manager.

Why Not a Joint Program?

Where operating units or companies with several small units could not justify an industrial relations set-up from a prohibitive expense standpoint, such small companies might well coordinate their joint labor program under one competent industrial relations executive who from a position of centralized control could administer a program applicable to all units that would involve employment procedure and records, investigation of working conditions, wages, earnings, etc., compensation, insurance, recreation, education, civic and public relations activities. You can build up your program from one mine to ten mines and you will have the same problems and you can achieve the same results if you are employee conscious.

It all depends on whether or not you want to put yourself in the other fellow's shoes, see his problems, his worries, his grievances, real or fancied—in short, his way of looking at you and your company. If you can see yourself and your company through his eyes, then you are on your way to a better understanding in employee relationships, because, after all, whether it is a large company with an elaborate program and set-up or a small operation with one-man control, the problem is fundamentally the same—the human element and the human equation individually and collectively respond to the same formula.

II—Behind "the Record" in Local Disputes*

By CAREL ROBINSON
Manager of Mines,
Kelleys Creek Colliery Co.
Ward, W. Va.

SOMETIMES we hear complaint that the mine owner's effort to uplift miners is not appreciated. In my opinion, this is because the owner looks down instead of across on the level eye to eye with the miners. The typical mine worker demands a fair wage and he respects the management that requires fair service. He resents paternalism because he desires to do his part. The management that recognizes the pride and human-feeling factor and acts accordingly will gain along with the owner. Teamwork will be profitable to the mining enterprise.

It has been my lot to take part in settling a large number of local labor disputes. In most cases, superintendents and foremen were able to prove that the worker had been at fault and that the company had complied with the technical terms of its agreement. When thorough investigation was made, however, nearly every case disclosed a vital factor "off the record" which was more important than the question directly at issue and was, in truth, the real cause for dispute. In this the operator was seldom, if ever, free from blame because the foreman or other contact man got his cue from the owner or from the owner's representatives in the management.

How Not to Do It

A few years ago, the vice-president of a company with several mines issued a general order that a system of checking men into and out of the mines should be established. In response to this order, the superintendent at one operation posted a notice which read:

> The company will provide a checkboard and a brass check with a number on it for each employee entering the mine. Beginning on Monday, every employee before entering the mine will be required to take the check assigned to him from the board, and when he comes out at quitting time he will be required to place his check back on the board. Any employee failing to hang his check on the board will be fined $1 for each failure.

The men refused to comply with this order and struck. After the strike had started it was urged that the requirement was for the safety and benefit of the workers, but the men took the position that it involved a change in conditions of employment not covered in the contract and they would not perform this duty unless an agreement for pay was reached. The company gave in to the men. The vice-president was very bitter and blamed it on a radical element at the mine and upon the union; he sincerely felt that the forces against him were unreasonable.

At an adjacent mine of the same company, the superintendent first went to a meeting of the local and told the men that his vice-president was very much concerned over what he considered a needless hazard to workers. The superintendent himself often feared that one of his men had been injured and left in his working place unknown to his fellows, and that his absence would not be discovered for some hours—with suffering and possible fatal results. He told them that after careful thought his vice-president and he felt that one helpful step would be a checking system; he outlined the plan proposed and asked for suggestions. The men had a number of comments; some of them were helpful, and after a short discussion it was agreed unanimously that the plan should be adopted.

Discussion brought out that if a man failed to hang up his check then a group of fellow workers under the direction of the foreman would proceed with a search. The superintendent expressed his feeling that if a man failed to hang up his check and thus made a search necessary, he should be penalized for his neglect. This was recognized as reasonable and fair, and was agreed to unanimously.

Courtesy Pays Dividends

As I interpreted it, the first group were resentful because they were not given the courtesy of a hearing before a change which affected them was put into effect, and their right was being ignored. Had the superintendent recognized their interest in this safety measure he could have secured indorsement of the men in enforcing it in half an hour.

Docking miners for loading impurities with coal has been a frequent cause for labor disturbances. Union contracts usually permit docking for the first and second offense and discharge for the third offense in one month. In some cases, unfortunately, when the management desired to get rid of a troublesome man orders were issued to the dock boss to single him out and check his cars with extra minuteness to give the company cause for his discharge. In such cases the men frequently felt that a clause to help with discipline and shipment of clean coal was misapplied and used unfairly to accomplish a different purpose.

There have been other cases when a

*Abstract of an address entitled "Securing Teamwork of Workers With Management at Coal Mines," before the 28th annual meeting of the West Virginia Coal Mining Institute, Beckley, W. Va., Oct. 4, 1935.

superintendent, "on the carpet" because of customer complaints about dirty coal, has issued peremptory orders for a drastic increase in number of docks. Here, too, the men resent a sudden change in requirements, although the company is technically within its rights. Because of such happenings, there is a widespread feeling of suspicion on docking and there is naturally a reactionary attitude against any effort to make changes in the system.

This fact was brought clearly before me a few years ago when the management of a mine decided to install a special picking table to permit a fairer and more dependable system of inspection. Members of the local union became much excited and sent a special committee to the management to discuss the proposed change. The manager took time to explain the importance of clean coal in securing orders, and each member of the committee was strong in agreement. The manager stated that the investment in what he called a "jury table" was made with a view of cooperation with the mine committee in correcting or eliminating the small number of men who were guilty of loading dirty coal and so working against the interest of the majority who were conscientious.

Committee Makes Suggestions

This manager put it up to the committee to suggest a plan of procedure, and this was done. Instead of depending on the judgment of the dock boss, as the coal was dumped a limited number of cars each day were to be bypassed to the "jury table" and on this the coal minutely inspected. The inspector or dock boss was to remove and weigh all of the coal inspected. Then the coal in the picking table would be carried forward and mixed with the other coal. If only a small quantity of impurities was found, the loader was given credit for a car of clean coal. If an excessive quantity of impurities was found, then the dock boss would ring for the tipple boss and checkweighman to check the impurities and agree on the penalty. This material was then laid aside for the loader himself to inspect. The men understood that the "jury table" was fair in its conception and administration, and at this mine there is practically never a dispute on docking.

In this case the company also agreed that the dock money would be held in a special fund and disbursed for the benefit of the entire community and only by mutual agreement. During the last few years this fund has been used for Christmas treats. Now, when a dock is imposed, the superintendent would hesitate to have it remitted because in doing so he would in effect be taking money from the Christmas treat for the children in the village, and this fact also influences the mine committee.

At one of the largest mines in eastern Kentucky, a few years ago the management decided that the manway being used was not safe, and a new manway was provided. Most of the workers began to use the new route, but possibly 100 continued to use the old manway. The manager of the company instructed one of the officials to stand at the entrance and notify all of these men that on the following day the unsafe manway would be closed and thereafter it would be necessary for them to travel the new route. Through some slip this official did not follow instructions and notify the men. When, therefore, on the next day they went to the old manway and found it barricaded they felt outraged and refused then to walk over to the new entrance. This resentment was carried through the working forces and it was only by very intensive and skillful work that a serious strike was avoided. It was fortunate that the manager was able to make clear that he had not intended to disregard the courtesy due these men.

"Robinsonisms"

• A mine manager may have more brain power than any one of his workers but not as much as the combined power of a group. If he is wise, he will secure benefit from the knowledge and brains of the group.

• If one wants teamwork, he must be willing to share the play. He must share the thrill of friendly combat and of creative mental effort.

• The typical mine worker demands a fair wage and respects the management that requires fair service. He resents paternalism because he desires to do his part.

• In most local labor disputes, the real cause usually is found in some vital factor entirely "off the record."

★ ★

Saving a Contract Job

At a southern West Virginia mine, a man was given a contract in accordance with the union agreement to work out an isolated area where there were not enough places for economical operation with the regular force of day men. Mining and hauling coal was conducted by the contract for a period of weeks. One night the mine committee came to the management and stated that the local had voted against permitting a continuance of the contract. After a two-hour discussion it finally leaked out that the workers in the contract section were getting more cars than men in other parts of the mine. The contractor had been overdiligent in securing empties, and this was the real cause for the complaint. When that was determined, it was very simple for the general superintendent to propose that he would see that the loaders for the contractor received no more cars than the men in other parts of the mine, and that the proportion of the force that was used for hauling, cutting and track-work would not be counted in the turn for the loader, in spite of the fact that these men loaded an occasional car. This was fair, and the committee readily accepted the proposal.

A few years ago when business was dull, a large captive mine made regular contributions to all employees who were not working. Expenditures were liberal, but as a practical thing the money was handed out as charity. While men were glad to get the cash, there was resentment from the loss of self-respect which resulted. Whether true or not, there was a feeling that the company was trying to buy loyalty with the idea of holding a company union and keeping out the United Mine Workers. When business improved, a number of bitter and costly strikes occurred.

Instead of giving the money as charity the company could have employed the men on an improvement program which was under consideration and divided the work fairly and with due regard to the size of families. Had this been done, there would have been no feeling that the company was trying to buy loyalty. The men would have earned what was paid to them, and this company would have benefited very greatly from completion of improvements in which labor was a principal item of expense.

Help—With Self-Respect

Another large company which did not have an improvement program helped its men, but required that they do their part. A large mine was to be idle for a period of weeks. The workers did not want to go on the dole, but many of them did not have money or personal credit. Under a plan worked out with the mine committee the following system was agreed upon: On request and approval of a special committee of the miners the company would issue orders on the store for a $1 to $1.50 per day to each idle man. These were to be treated as a separate fund and when work was resumed each individual would be required to pay off the indebtedness gradually during a period of two months. In case any of the individuals would not or could not pay off their indebtedness, a special check-off would be made against all of the men at the mine and the company reimbursed through this check-off. This plan, which has been used twice, has aided the men and has helped the entire group with a feeling of self-respect. Incidentally, the company was able to make a regular profit on the merchandise sold and it was unnecessary to raise prices to cover losses which would occur if credit had been extended to all of the individuals. Friendly relations have been improved at this operation as a result of these two business deals.

NEW HARMAN MINE

+ Latest and Largest Operation

In Grundy Field of Virginia

LAST January marked the first shipments of coal from the eighth mine to be brought into production in the Grundy field in Buchanan County, Virginia. This mine, opened by the H. E. Harman Coal Corporation, is equipped with a screening and loading plant with a normal rating of 450 tons per hour and is the largest operation in that new field. Approximately $325,000 has been invested in the plant and more will be required as the output is increased. Experience gained from many years of successful operation of the Warrior Coal Co., Warriormine, W. Va., owned by substantially the same interests and nearing depletion, is reflected in the simplicity, efficiency and sturdiness of the Harman plant.

Shipments from this new mining district go out over a branch line of the Norfolk & Western Ry., joining the main line at Devon, about 18 miles from Williamson, W. Va. (*Coal Age*, August, 1934, p. 302). The Harman mine—on Bull Creek—is served by a four-mile spur built as a part of the mine project and connecting with the branch line at a point about 6½ miles from Grundy.

Up to January, all mines that had been opened in the Grundy field were in the Clintwood seam, and at each of those mines an aerial tram, plane or conveyor is employed to bring the coal down the mountainside to the tipple. The Harman mine is in a seam lying about 550 ft. lower than the Clintwood and its tipple is located so that the feeder hopper of the mine-car dump delivers by gravity directly to the tipple screens. The elevation of the outcrop at the tipple is 1,297.8 ft. and the elevation of the railroad tracks serving the tipple is 1,227 ft.

Locally the seam is termed the Dictator. Undisputed information as to its correlation with some well-known coal of an adjoining district was not available, but indications point to its being a deposit of the same period as the Splash Dam seam. The split now being mined at Harman is 53 in. thick and contains but one parting, this a 2- to 3-in. layer of slate, generally soft, but in places difficult to cut with a mining machine. The top is a strong slate and the bottom a hard rock. The mine product is sold on a specification of 3.75 to 4 per cent ash. A dry analysis of a channel sample revealed the following: ash, 3.41 per cent; volatile, 29.23 per cent; fixed carbon, 67.36 per cent; B.t.u., 15,162; sulphur, 0.75 per cent. It is a coking coal and is said to be well adapted to byproduct use.

Approximately 11,000 acres are under lease and, if desirable, all of the coal in the area can be shipped from the plant in its present location. The seam dips uniformly to the northwest on a pitch of not over 30 ft. per mile and indications are that the local dips and rolls to be encountered will not present severe grades. Gas in small quantities is already being encountered in the mine, an unusual condition in view of the fact that the coal outcrop is 70 ft. higher in elevation than the railroad tracks, which are close to creek level.

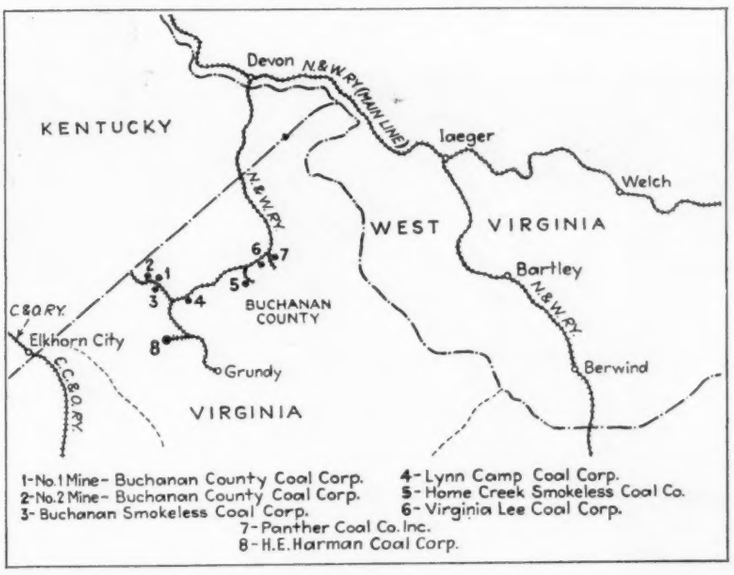
A large acreage of the Clintwood coal —average thickness 48 in., practically free of parting—lies 550 ft. higher in elevation and awaits development. Railroad tracks are graded to allow building a Clintwood seam tipple 100 ft. upgrade from the present tipple.

Roberts & Schaefer was given the contract to supply the surface plant complete, including car-handling and dumping equipment. The tipple, in which all screening is done on a Marcus unit that includes picking tables, rescreens, refuse conveyors and domestic coal conveyor, is a four-track steel structure equipped with three apron-type loading booms.

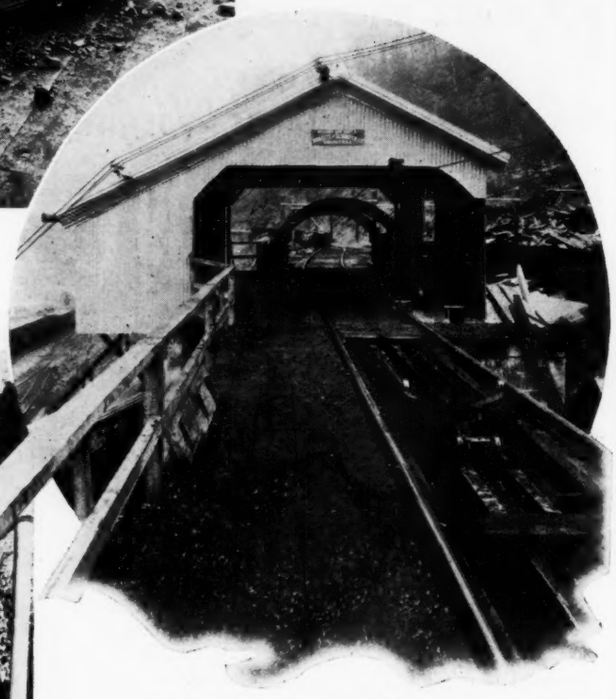
Mine cars, after being weighed on a 20-ton Toledo "Print-weigh" scale, are unloaded at the rate of three per minute in a single-car rotary dump of the electrically driven type, making a complete revolution to effect dumping. The haulage trip is handled through the dump without uncoupling and is propelled by a motor-driven feeder which engages the rear bumper rather than a lug on the under side of the car.

Construction of the dump is such that the haulage locomotive can, if the track

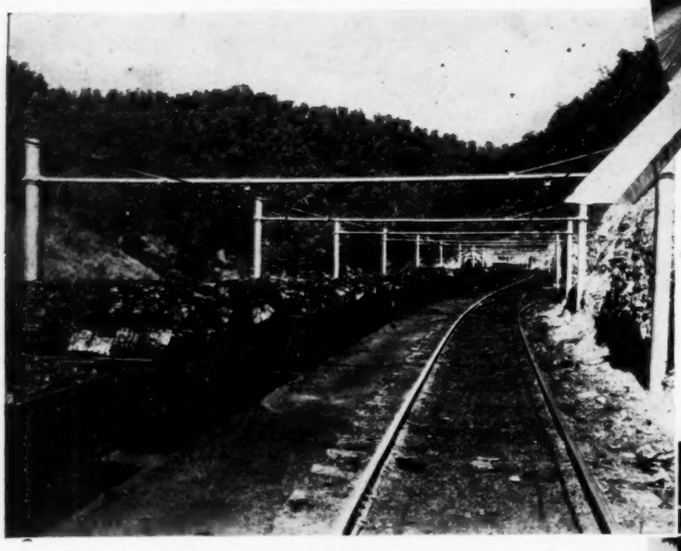
Harman is the eighth mine opened in the Grundy field



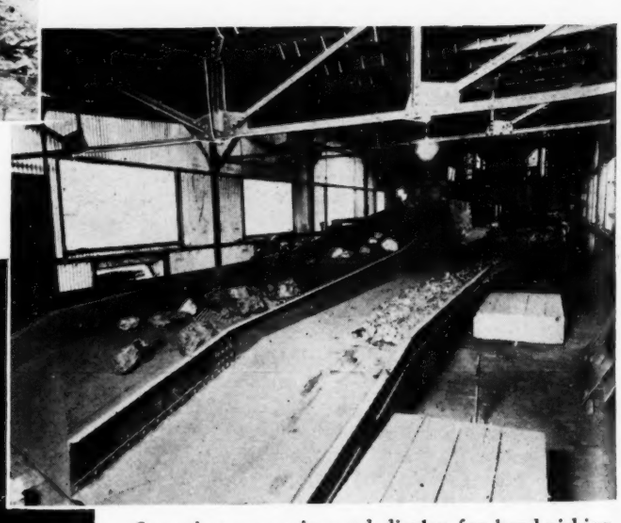
Feeder stops engage the outside corners of car body



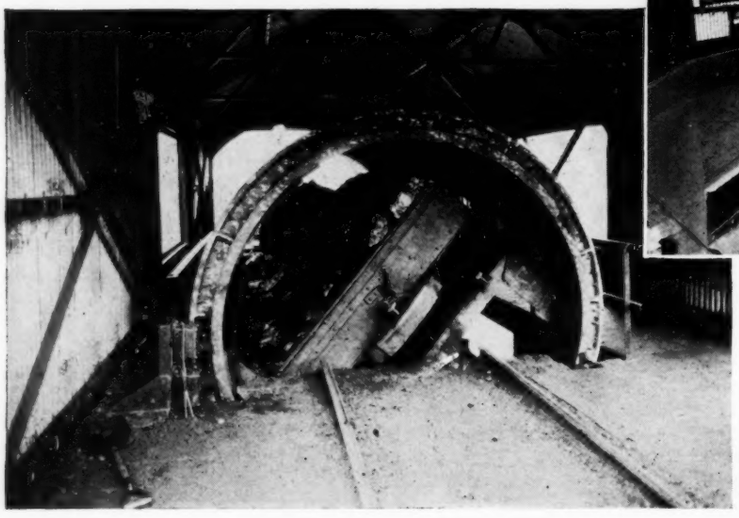
Note feeder (right) which engages car bumpers



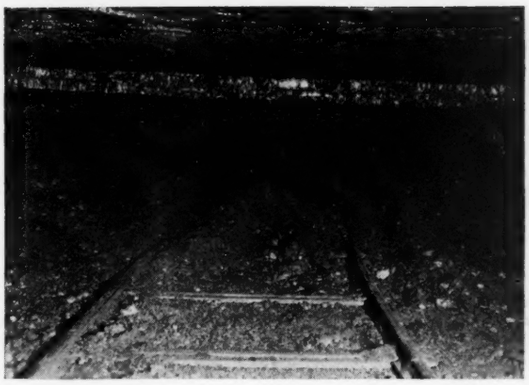
The load in the left foreground is close to 8 tons

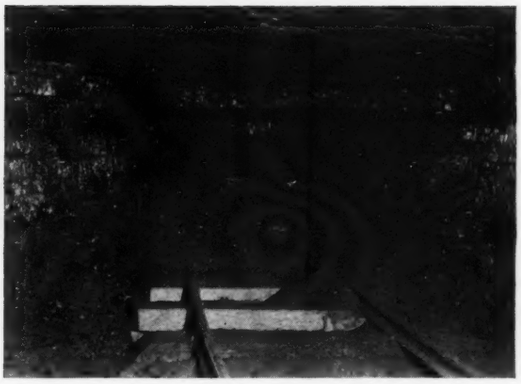


Screening, conveying and display for hand-picking are accomplished by this 20x95-ft. Marcus unit



Fingers come out and project over the top edges of the car to hold it as it is carried through a complete revolution





Left, cutting out the parting has just been completed in this room; right, heading with cut completed in the parting; here the bottom rock and part of the bottom coal is taken to provide height for main haulage

is clear, go on through and spot the first car for dumping. When the dump turns 5 deg., three fingers on each side come out to engage the top edges of the car and act as hold-downs. These fingers snap back as the dump completes the revolution.

The feeder hopper under the dump is a gravity chute holding 50 tons and terminating at the screen feeder, of the reciprocating variable-feed type. To minimize breakage at the dump the feeder hopper is kept nearly full.

A Marcus No. 10 driving head imparts motion to the screening unit, which is 20 ft. wide and 95 ft. long with a primary screening surface 6 ft. 9 in. wide. The design of the complete unit lends itself to quick changing of screen plates and to effecting diversions for preparing mixtures of many different sizes. Included also is a provision for preparing a fifth size and for adding a crusher. Loading booms have 23-ft. horizontal and 43-ft. hinged sections.

Simplicity is an outstanding feature of the tipple. The drive sprockets of all three loading-boom conveyors are on a common headshaft driven at one end by a Westinghouse Type FD 20-hp. gearmotor with an armature speed of 870 r.p.m. and drive-shaft speed of 27 r.p.m. Excluding the three boom hoists but including the trip feeder and rotary dump drives, only five electric motors are employed in the plant and these total but 90 connected horsepower. All are Westinghouse motors wound for 440 volts. V-belts operating over a grooved motor pulley and over a flat-faced 8-ft. flywheel constitute the motor drive connection of the Marcus screen. The 7½-hp. motor driving the dump is of the two-speed type. This dump motor and the 15-hp. car feeder motor are both equipped with solenoid brakes. Corrugated galvanized iron coverings of the buildings are "Toncan Copper Molybdenum"—No. 22 gage on the roof and No. 24 on the sides.

The mine is being developed for an advanced robbing system in which the rooms will be driven 20 ft. wide. The parting, which is near the top, is being cut out with mounted slabbing machines, and at present this work is being done by three Goodman No. 224BA units with 9-ft. cutter bars. Another machine of the same type is on order. Where the parting is medium to hard in character three to four places are cut per set of ordinary steel bits. In a few places the parting is too hard to be cut economically and the cut is made in the coal just below the parting.

On main-haulage headings a height of 6½ ft. is provided by taking the 10-in. bottom rock and a part of the underlying coal, which is 18 in. thick. Miners do their own drilling and shooting.

A track gage of 48 in. was selected for the mine. Sixty-pound steel is used on mains and cross headings and 30-lb. on butts and in the rooms. Steel ties are used exclusively in rooms, and ties of that type but of heavier design are also to be used on the 60-lb. track in cross headings—that is, as far as the sidetracks. Wood ties are used on the main headings.

Transportation equipment purchased to date consists of 200 Enterprise solid-body steel cars with a weight of 4,575 lb. each and a level-full capacity of 122 cu.ft. Inside dimensions are 7x12 ft., rail clearance is 2¼ in., and height above the rail is 25 in. The car is equipped with four axles on a 48-in. wheelbase; Timken-bearing 14-in. wheels; cast-steel boxes; and a two-wheel double-band brake. Loop or eye fittings on both sides of the car at the central points of the lower outside edges of the body provide places for hooking chains to fasten the car to the track as a safety precaution at the face.

Average loading is 5 tons and it is not unusual for 8-ton loads to appear. Swivel hitchings used with the cars are of the Bonney-Floyd alloy steel heat-treated type equipped with safety rings.

Traction equipment now at the mine consists of one Westinghouse 10-ton No. 907 main-haulage locomotive and six Westinghouse 6-ton No. 904 cable-reel locomotives.

Electric service is purchased from the Appalachian Electric Power Co. at 6,600 volts. The substation, owned by the coal company, contains one new Westinghouse 300-kw. synchronous converter rated 250-275 volts direct current and operating at 1,200 r.p.m. Its starting equipment is manual control but the feeder breaker is of the automatic reclosing type. Size No. 6/0 trolley wire is being installed on main haulways and No. 4/0 on the cross and butt headings.

Electric cap lamps are used exclusively in the mine and the present equipment consists of 300 Edison Model K and 100 Wheat Type WTA. The lamphouse is about midway between the No. 1, or South Main, and the No. 2, or North Main, openings. The latter is on the opposite side of the creek from the tipple and about 1,000 ft. up the hollow from No. 1.

Ventilation at No. 1 is being handled temporarily by a new fan made up of "Charavay" airplane-type propeller blades mounted directly on the shaft of a General Electric four-speed induction motor. At No. 2 opening a small multi-bladed fan brought from the West Virginia mine suffices for present needs.

Because most of the mine labor is drawn from the surrounding country and the mine is but 10 miles from Grundy, the county seat, the coal company has not embarked on a large program of building individual miners' houses but has built a miners' boarding house and fifteen homes for other employees. All employees must pass a physical examination by the company physician, whose office is within 500 ft. of the lamphouse and includes clinical equipment with items such as high-powered microscope, X-ray machine and eye-testing apparatus.

From an initial loading of one car on Jan. 16 the mine production was increased to 2,400 tons per day by Sept. 20. The main headings have been advanced 3,600 ft. from the portal.

H. E. Harman, of Tazewell, Va., heads the company; G. D. Davidson, Warriormine, W. Va., is superintendent; H. A. Kiser, of Tazewell, chief engineer; and C. J. Asbury is general mine foreman. The coal is sold through the Norfolk & Chesapeake Coal Co., of Detroit, Mich.

DEWATERING COAL

+ Receives Greater Stress in Preparation With Rise of Wet Washing—II

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CHANGES in physical and chemical characteristics of the coal in the process of centrifugal drying follow a fairly general course; *i.e.*, the tendency is to accomplish one or more of the following:

1. Materially reduce moisture. This depends upon the load imposed on the dryer, the size characteristics and per cent of moisture in the coal, and size of holes and amount of open area in the screen plates. Unless the moisture content of the product is under 7.0 per cent there is a size segregation in the discharge hopper under the dryers, due to windage caused by the rotor. The larger sizes separate from the mass of coal, leaving the fines, which are much higher in moisture, to adhere to the hopper inclosure and finally build up solid or drop in large masses into the conveyor.

2. Break down the large size or plus 4-mesh coal. Table V shows that in the AR-1 and AR-12 dryers from 17.0 to 47.6 per cent of the plus 4-mesh and from 1.3 to 6.2 per cent of the 4x14-mesh material is broken down into the minus 14-mesh sizes and 12.3 per cent of the plus 10-mesh in the AR-4 type.

Breakage of the plus 4-mesh coal was very largely eliminated at Champion No. 1 by the use of a "scalping" screen on the feed to the Carpenter dryers. The minus $\frac{3}{8}$-in. coal is put over a shaking screen with a 5x24-ft. screening surface. Screens are equipped with No. 16 U.S.S. Ga. stainless-steel screen plates with $\frac{1}{4}$-in. perforations. Being bright and of thin gage, the screen plates keep open and do not blind.

The plus $\frac{1}{4}$-in. oversize from the screen bypasses the Carpenter dryers and is run direct to the conveyor carrying the product from the dryers. The $\frac{1}{4}$-in. undersize is laundered to a dewatering elevator, which discharges to the dryer feed spout or conveyor. The screen oversize mixed with the dryer discharge gives a product with a considerable increase in plus 4-mesh material and with satisfactory moisture content. By using the screen the feed tonnage was reduced so as to eliminate one dryer.*

3. Reduce ash and sulphur. There is an ash and sulphur reduction in the material passing through the dryer, the amount of reduction depending on the chemical characteristics of the sizes in the feed. Table VI and curves Figs. 2, 3 and 4, (*Coal Age*, October, 1935, p. 409) show the ash and sulphur contents in the total and in the sizes of the products from the various dryers, excepting the AR-4 type, on which figures on separate sizes were not available.

The AR-1A and AR-4 dryers show a very slight reducion in ash and sulphur, while the AR-1B and AR-12 show 0.7 and 1.1 per cent reduction in ash and 0.05 and 0.10 per cent reduction in sulphur. Feed coal to the AR-1A and AR-4 dryers passes over a $\frac{1}{3}$-mm. wedgewire screen (equivalent to 65-mesh) before going to the dryers. The screens eliminate considerable of the high-ash and high-sulphur fines.

The AR-1B and AR-12 dryers receive their feed from a dewatering elevator which does not remove the high-ash and sulphur fines. The reduction of ash and sulphur in the sizes under 48 mesh is quite evident. The breaking down of the low-ash, more friable coal in the plus 4-mesh material into the finer sizes results in a lower ash in the fines of the effluent than the same sizes in the feed, although the head sample of the effluent is higher in ash and sulphur than the feed, due to the high percentage of high-ash minus 100-mesh material in the effluent.

The first and third above are obviously market advantages, but the breakage may cause reduction in the realization value of the fuel. The cost and difficulty of handling fine coal increases considerably as the quantity of extreme fines (minus 48-mesh) increases. The final material with excess fines retains moisture and segregates in bins, spouts

*The AR-12 type dryers are an early design the manufacture of which has been discontinued. The AR-1 and AR-2 types were developed to reduce the breakage of coal and effect other improvements in operation and maintenance costs and give lower power consumption. As described hereinafter, all of these improvements are being obtained.

Table V—Breakage Summary of Carpenter-Dryer Products, Showing Change in Sizes

Size Mesh	AR-1A Dryer Difference* in Feed: Change in Per Cent Inc.	Change in Per Cent Dec.	Percentage of Change Inc.	Percentage of Change Dec.	AR-1B Dryer Difference* in Feed: Change in Per Cent Inc.	Change in Per Cent Dec.	Percentage of Change Inc.	Percentage of Change Dec.	AR-12 Dryer Difference* in Feed: Change in Per Cent Inc.	Change in Per Cent Dec.	Percentage of Change Inc.	Percentage of Change Dec.	Size Mesh	AR-4 Dryer Difference* in Feed: Change in Per Cent Inc.	Change in Per Cent Dec.	Percentage of Change Inc.	Percentage of Change Dec.
¼in.x4	...	7.6	.....	28.1	....	3.3	....	17.0	...	11.4	....	47.6	¼in.x10	...	8.5	.....	12.3
14	...	2.7	.....	6.2	10.8	...	29.6	....	...	0.5	....	1.3	14	1.0	...	11.5	....
...	...	...	.....	.....	....	....	....	.....	...	...	.....	.....	28	2.4	...	15.9	....
48	5.8	...	19.3	....	....	6.4	....	20.4	6.3	....	22.5	....	48	1.5	...	30.6	....
100	2.0	...	57.2	....	....	1.8	....	24.0	2.2	....	48.8	....	..	...	...	.....	....
200	0.8	...	80.0	....	0.6	...	40.0	....	1.0	....	66.8	....	..	...	...	.....	....
—200	1.7	...	170.0	....	0.1	...	3.0	....	2.4	....	68.9	....	—48	3.7	...	185.0	....

*Difference in per cent between feed and composite of product and effluent.

Table VI—Chemical Characteristics of Carpenter Dryer Products in Per Cent

Mesh Size On	AR-1A Feed Ash.	AR-1A Feed Sul.	AR-1A Product Ash.	AR-1A Product Sul.	AR-1A Effluent Ash	AR-1A Effluent Sul.	AR-1B Feed Ash.	AR-1B Feed Sul.	AR-1B Product Ash.	AR-1B Product Sul.	AR-1B Effluent Ash.	AR-1B Effluent Sul.
Head	5.9	1.00	5.8	1.00	6.9	1.05	6.0	0.95	5.3	0.90	7.4	1.10
4	6.0	0.95	6.6	0.95	....	....	5.3	0.90	5.4	0.80	....	....
14	5.3	0.95	5.1	0.95	5.5	0.95	5.0	0.85	5.0	0.85	5.3	0.85
48	5.7	1.05	5.5	0.95	6.0	0.95	5.0	0.95	4.7	0.95	5.0	0.85
100	9.3	1.10	6.1	1.05	8.5	1.00	10.7	1.10	7.3	1.05	8.9	1.05
200	13.3	1.45	5.9	1.05	10.3	1.35	16.5	2.90	9.5	1.60	14.1	2.25
—200	13.5	1.45	7.6	1.10	13.0	1.20	12.9	1.50	10.0	1.40	12.7	1.50

Mesh Size On	AR-12 Feed Ash.	AR-12 Feed Sul.	AR-12 Product Ash.	AR-12 Product Sul.	AR-12 Effluent Ash	AR-12 Effluent Sul.	AR-4 Feed Ash.	AR-4 Feed Sul.	AR-4 Product Ash.	AR-4 Product Sul.	AR-4 Effluent Ash.	AR-4 Effluent Sul.
Head	8.8	2.30	7.7	2.20	13.7	3.00	6.3	0.96	6.2	0.95	6.8	1.08
4	6.5	2.00	7.3	2.00	7.6	2.15	....	....	....	....	....	....
14	6.4	2.00	6.5	2.00	6.7	2.05	....	....	....	....	....	....
48	7.5	2.05	7.0	2.00	8.3	2.05	....	....	....	....	....	....
100	20.5	3.80	12.5	3.00	20.1	3.75	....	....	....	....	....	....
200	34.3	9.90	18.7	6.50	30.5	9.20	....	....	....	....	....	....
—200	30.4	6.05	23.0	5.85	29.1	5.70	....	....	....	....	....	....

Table VII—Relation of Screens to Tonnage

	Tons of Coal in Effluent* Feed Per Hr.	Tons Per Hr.	Per Cent of Dry Feed	Screens: 1/8-in. Hole No.	1/8-in. Hole Sq. Ft. Surface Gross Area	1/16-in. Hole No.	1/16-in. Hole Sq. Ft. Surface Gross Area	Total Surface Sq. Ft. Gross Area	T.P.H. Per Sq. Ft. Feed	T.P.H. Per Sq. Ft. Effl.
AR-1A	23	3.3	14.1	16	27.2	8	7.8	35	.66	0.1
AR-1B	21	1.0	4.8	24†	35.0	..	..	35	.60	0.03
AR-12	68	16.0	23.5	..	....	42	82	82	.83	0.19
AR-4	30	2.1	7.0	..	....	24	46	46	.65	0.05

*Tons per hour on moisture free basis. †All rows.

and conveying apparatus, causing intermittent flow.

The quantity of coal in the effluent from the various dryers shows considerable variation in terms of per cent of feed. The large difference is due to:

1. The difference in the amount of screen surface, size of holes in screens, depth of coal bed on screens and the running clearance between feed hopper and rotor; also the number of holes worn in the screens (see Table VII).

2. The quantity of minus 48-mesh in the feed coal bears only indirectly on the quantity of fines in the effluent. The beds of coal on the screens retard the passage of the fines through the screen.

The figures in Table IV for the AR-1 and AR-12 dryers show a high per cent of plus 14-mesh material in the effluent, although screens have 1/8-in. and 1/16-in. holes. The oversize is due to worn screens and clearance between stationary feed hopper and rotor. This condition has been minimized in the AR-4 type dryer and is reflected in the screen analysis of the effluent as shown in Table IV.

Treatment and disposal of the effluent is one of the major problems in centrifugal drying. The effluent from the AR-1A, AR-1B and AR-12 dryers was recirculated to either the washed-coal dewatering elevators or to the fine-coal washing units. The effluent from the AR-4 dryer was run to a dewatering elevator which fed a separate secondary dryer. The effluent from the secondary dryer ran to the same dewatering elevator boot, the overflow of which returned to the washery sludge system.

Recirculation is unsatisfactory because it returns the high-ash material and minus 48-mesh sizes to the water system and thereby increases the percentage of solids, which retards the settling and causes an accumulation and recirculation of the high-ash and high-sulphur fines under 100-mesh. This soon reflects in the final washed coal products. The quantity of sludge also increases.

The most satisfactory method of treatment is to use a separate dryer for effluent or effluent mixed with the same class of feed as the primary dryers and waste the high-ash effluent, or as described in use with the AR-4 dryers. The resultant product is higher in moisture than the product from the primary dryers and entails extra operating costs and capital expenditure. Here is a field for a successful and economic vibrating screen to screen 65- to 100-mesh.

Table VIII summarizes operating data of the products from the Carpenter dryers, showing relationship of tonnages, moisture and breakage.

Since the tests shown in Table VIII were made, the effluent from the AR-12 dryers at Champion No. 1 was treated on a vibrating screen. The screen is 36x108 in. long, set on an angle of 18½ deg. from horizontal, equipped with ⅛-mm. phosphor bronze wedgewire screen. The oversize is mixed with the feed to the same dryer from which effluent is taken. The undersize, being high in ash and sulphur, is wasted and not returned to the washery water system. The screen gave about a 50 per cent elimination of the minus 100-mesh material.

Treatment of effluent on the vibrating screen instead of recirculating shows a reduction in ash and sulphur in the product from the dryer. The elimination of the minus 100-mesh material by the screen gave a reduction in the quantity of the sludge produced. The per cent of solids in the circulating water decreased, with resultant elimination of water-system troubles.

Table IX shows size, ash and sulphur characteristics of products from the vibrating screen. The feed to the screen was the effluent from one dryer handling a minus ⅜-in. feed coal.

In order to obtain a high elimination of the minus 100-mesh material it was necessary to use sprays over the screen. As a result the oversize was discharged with a high percentage of moisture. This could be further reduced to about 25 per cent by passing over another screen. Recently a concentrating table has been used to clear up the dryer effluent. This is working out very satisfactorily.

The largest single item of maintenance is screen replacements and upkeep

Table VIII—Comparison of Operation of Carpenter Dryers

	AR-1A		AR-1B		AR-4		AR-12	
Per cent moisture in feed	23.3		19.0		20.2		22.6	
Per cent moisture in product	5.2		9.1		7.2		6.5	
Per cent solids in effluent	35.7		25.1		29.6		49.6	
	TPH	Per Cent	TPH	Per Cent	TPH	Per Cent	TPH	Per Cent
T.P.H. per dryer (dry) of feed	23	100.0	21.0	100.0	30	100.0	68	100.0
T.P.H. per dryer (dry) of product	19.7	85.9	20.0	95.2	27.9	93.0	52	76.5
T.P.H. per dryer (dry) of effluent	3.3	14.1	1.0	4.8	2.1	7.0	16	23.5
G.P.M. water per dryer in feed	28	100.0	20.0	100.0	30.8	100.0	79.4	100.0
G.P.M. water per dryer in product	4.4	15.7	8.0	40.0	8.8	28.6	14.4	18.2
G.P.M. water per dryer in effluent	23.5	84.3	11.8	60.0	22.0	71.4	65.0	81.8
T.P.H. plus 4-mesh in feed	4.60	20.0	4.1	19.5	....	....	16.3	24.0
T.P.H. plus 4-mesh in product	2.85	14.5	3.4	17.0	....	....	8.3	16.0
T.P.H. plus 4-mesh in effluent	.05	1.5	....	....	....	....	0.3	1.5
Tons per hour breakage of 4-mesh per dryer	1.7	....	0.7	....	....	....	7.7	....
Per cent of 4-mesh in feed broken to minus 4-mesh	....	38.1	....	17.0	....	....	....	47.6
Size holes in screen plates	⅜-½ in. ⅜-⅝ in.		All ⅝ in.		All ½ in.		All ½ in.	

Table IX—Comparison of Products of the AR-12 Carpenter Dryer Effluent Treated on Air Vibrator Screen

Size Characteristics: Size Mesh*	Feed	Oversize†	Undersize‡	Ash and Sulphur Characteristics: Size Mesh	Feed Ash.	Feed Sul.	Oversize Ash.	Oversize Sul.	Undersize Ash.	Undersize Sul.
...	....	....	....	Head	10.9	2.65	8.9	2.15	26.1	5.70
4	0.5	1.0	....	4	7.3	1.70	7.3	1.50	....	....
14	13.5	15.5	....	14	6.1	1.65	6.2	1.65	....	....
48	54.0	59.0	1.0	48	7.0	1.70	6.9	1.70	11.8	2.30
100	17.0	16.0	32.5	100	11.2	2.25	10.8	2.30	18.3	3.50
200	2.5	2.5	13.0	200	22.9	5.85	21.5	5.20	28.7	7.90
—200	12.5	6.0	53.5	—200	31.4	7.25	27.4	6.00	29.8	6.75
Per cent moisture	57.6	51.0	86.0	....	....	....	....	....	....	....

*Tyler standard screen sieves. †Returned to Carpenter dryer feed. ‡Wasted.

(see Table XI). Experimental work has been carried on to find the proper material for use in screens and at the same time obtain maximum drying conditions. Steel-plate screens were used at first with $\frac{1}{16}$-, $\frac{3}{32}$- and $\frac{1}{8}$-in. holes in 16, 12 and 10 gages. In all cases wear was rapid and holes were completely closed in four or five days, due to rust. The most satisfactory material found so far has been stainless steel or Ascoloy No. 33, pickled, having the maximum thickness that can be punched. Experiments were made also to find the minimum area or opening that could be used without increasing the moisture in the product. It was found that the less the open area the longer the life of the screen. Table XII gives comparative data of screens for various size of holes and open area as originally and finally adopted.

The Champion plants use $\frac{1}{8}$-, $\frac{3}{32}$- and $\frac{1}{16}$-in. holes, depending on the moisture content desired in the product. The screens are operated with an angle $\frac{1}{2}$ in. high, placed about 5 in. from the top of the screen, in order to form a bed of coal on the upper part of the screen to prevent wear at impact points and prolong the life of the screens. The beds as used reduce the quantity of effluent but increase the moisture content of the product about 0.5 per cent. Dryer screens are inspected after each day's run. As holes are worn in screens, they are patched with bolts and washers and discarded when about 75 per cent of the screen area is covered. (The number of screens and screen area for each type dryer are shown in Table X.)

Costs of the AR-1 and AR-12 dryers, shown in Table XI, were determined for a six months' period after the dryers had run for the periods and with tonnages as tabulated. The AR-4 dryer was newly installed and costs cover a tonnage as noted. No repairs other than screens were made over this period. The item under screen plates includes material only, screens and bolts. Other repair costs include material costs of dryer parts other than screens. The principal wearing parts are spider rims, feed disk, wearing liners on which coal impinges in base of dryer, anchor rings, impact plates and bed angles on screens.

Table X—Screen Data

Type	Row	No. Screens	Total Area* Sq. Ft.
AR-1A	1	8	7.79
AR-1B	2	8	11.50
	3	8	15.71
Total		24	35.00
AR-4	1	8	10.78
	2	8	13.35
	3	8	21.87
Total		24	46.00
AR-12	1	6	13.67
	2	12	18.20
	3	12	22.72
	4	12	27.41
Total		42	82.00

*Gross area.

Table XI—Operating and Maintenance Costs of Carpenter Dryers

Type	AR-1	AR-4	AR-12
Total period of operation in dryer hours*	21,920	None	11,760
Total tonnage passed through dryer*	630,000	None	645,000
Total tonnage on which costs are based (dry product)	201,000	248,900	227,000
Number dryer hours on which costs are based	8,710	.....	6,300
Cost in Cents Per Ton of Discharged Product			
Screen plates	.395†	.379‡	0.650‡
Other repair costs	.286	.....	.180
Lubrication	.075	.008	.050
Power costs based on 1.0c per kw.-hr	.660	.713	1.100
Screens and patching	.185	.061	.250
Maintenance labor			
Other repairs	.045	.....	.130
Operating labor	.260	.301	.280
	1.906	1.462	2.640

*Previous to six months, period over which costs were taken.
†$\frac{1}{8}$-in. holes—No. 18 Ga. Ascoloy No. 33.
‡$\frac{3}{32}$-in. holes—No. 13 Ga. Ascoloy No. 33.

Average labor costs per hour operating, $0.60
Average labor costs per hour maintenance, $0.62½
Average labor costs per hour lubrication, $0.55

Table XII—Size of Openings

Size, Hole, In.		U.S.S. Gage	Per Cent Openings Originally Used	Per Cent Openings Finally Adopted
$\frac{1}{16}$	Ascoloy No. 33, pickled	18	22½	15½
$\frac{3}{32}$	Ascoloy No. 33, pickled	16	33	22½
$\frac{1}{8}$	Ascoloy No. 33, pickled	13	40	22½

The maintenance of gears and antifriction bearings has been negligible.

The cost of lubrication is small. Lubrication includes material only, oil and grease. Labor of lubrication is included in maintenance labor. Maintenance labor performed by dryer operator includes daily inspection, patching and renewing screens. Other repairs are made by the maintenance force. Operating labor for the AR-1 and AR-12 dryers consists of one man devoting half time to operating dryers and the balance of time to other units. For the AR-4 dryer one man devoted full time to the dryer, due to location. Labor costs for the AR-1 and AR-12 dryers are based on hourly rates tabulated in Table XI. Power costs are based on 1.0 cent per kilowatt hour.

The AR-1 dryers are equipped with a General Electric 40-hp., 1200-r.p.m. type M.T. motor with V-belt drive. The AR-12 and AR-4 dryers have 75- and 50-hp. motors, respectively. Speed ratios are given in Table III. (*Coal Age*, October, 1935, p. 410). The dryers have a high starting torque but come up to speed in about ten seconds. Table XIII shows the tonnage-power relation.

It was found that by increasing the speed of rotor of the AR-12 dryer from 269 to 283, or 5.2 per cent, the horsepower jumped from 78 to 91, or 16.8 per cent, without any material reduction in moisture. This is in line with experiments carried on by F. Prockat,[2] wherein he stated that "If a centrifugal force of thirty times the magnitude of gravitational force is applied to the sludge, the efficiency of dewatering increases 3 per cent."

[2]"Centrifugal Dewatering of Coal and Clarification of Water," by F. Prockat, V.D.I (Berlin), Vol. 74, No. 51; Dec. 20, 1930; pp. 1729-1734.

Table XIV—36-In. Elmore Dryer Data

Type	36 in.
No. of dryers operating	1
Diameter of rotor basket	36 in.
Dimensions of base	4 ft. 8 in. x 4 ft. 8 in.
Over-all height*	8 ft. 5 in.
Speed—basket	1,058 R.P.M.
Speed of flight cone	1,038
Peripheral speed of tip of basket	10,000
Centrifugal force—lb. per lb. of load	600
Rim tension in lb. per lb. of load	96
Hp. empty	26
Hp. full load	41
Capacity, tons per hour dry product	34
Hp. per ton dry product	1.20
Sq. ft. screen surface, gross area	11.5
Tons effluent (dry solids)	7.4
Tons effluent per sq. ft. screen surface	0.64
Screens	$\frac{1}{16}$-in. hole steel No. 16 Ga.
Pitch of screen basket from horizontal	52 deg.
Weight	9,000 lb.
Size motor	50 Hp.
Kind motor	Slip ring vertical direct connected
Per cent moisture feed	22.5
Per cent moisture, product	6.1
Per cent solids effluent	43.6
Dry solids in effluent, per cent of dry feed	18.0
Tonnage dry feed per hour	41.4

*Including Discharge Hopper.

The Type AR-4 dryer has overcome considerable of the operating and maintenance troubles encountered by the AR-1 and AR-12 types. Running clearances between feeder hopper and effluent trough and rotor have been improved and leakage into effluent trough reduced. Wearing surface at bottom of rotor has been redesigned so as to reduce wear on plates and breakage of 4-mesh coal. Positive oil seal in gear case has eliminated leakage of gear lubricant.

The AR-4 and AR-12 types, produce considerable windage due to the high-speed rotor, so that conveyors receiving dryer discharge should be inclosed to prevent fines from being blown out of the conveyor. In the AR-4 windage has been reduced by redesign of the rotor ribs. The reduced windage also shows a decrease in power consumption. The AR-4 is made with a steeper cone angle, which makes it possible to retain a bed of uniform thickness on the screens.

Wherever possible, dryers are fed by

Table XIII—Tonnage-Power Relation

	Motor	Starting Load-HP.	Empty Load-HP.	Running Load-HP.	Speed of Rotor Loaded	Dryer Discharge Dry Coal Tons Per Hour	HP. Per Ton Dry Coal
AR-1A, AR-1B	40 HP.	65	12	22.5	370	19.7	1.14
AR-4	50 HP.	..	11	39	341	27.9	1.39
AR-12	75 HP.	85	37	78	267	52	1.50

Table XV—36-In. Elmore Dryer Test Showing Size Relation of Dryer Products

	Per Cent of Dry Feed	On Mesh 4	14	48	100	—100
Feed	100.0	22.5	38.8	28.9	3.8	6.0
Product	82.0	16.4	47.5	28.2	3.6	4.1
Solids in Effluent	18.0	0.0	0.4	59.5	14.1	26.0

Table XVI—Ash Relation, Elmore Dryer Products

	Per Cent of Dry Feed	Ash in Sizes Head	4	14	48	100	—100
Feed	100.0	8.7	6.5	6.2	8.2	26.9	32.4
Product	82.0	6.9	6.5	6.0	6.7	13.6	17.8
Effluent	18.0	16.7	...	...	9.1	25.1	31.4

spouts set at 42 to 45 deg. instead of screw conveyors, due to excessive wear and high maintenance cost of screws and casings. Discharge hoppers from dryers handling minus ⅜-in. coal should have steep sides, preferably 60 deg. or more from horizontal. Hoppers should be made in the form of an inverted frustum of a rectangular pyramid, without valleys, rather than a cone. Hoppers should have large doors for access to inside of dryers.

The dryers require a small amount of operating attention and, contrary to belief, do not require skilled labor for operation and maintenance.

Experiments were conducted on a 36-in. Elmore type centrifugal dryer over a period of three months under operating conditions with the same class of feed as to the AR-12 dryer. Results of experiments are given in tables XIV to XVI.

The sludge or Dorr thickener underflow which runs under 28-mesh is dewatered in Oliver and Dorr type vacuum filters and also on Laughlin centrifugal-type filters. Sludge is pumped with Wilfley and Morris centrifugal pumps to a receiving tank ahead of the filters. The sludge is pumped with 30 to 50 per cent solids and discharged from filters at 20 to 24 per cent moisture, depending on the quantity of plus 48-mesh material in the product. The dewatered product from the filters is mixed with part of the minus ⅜-in. product from the Carpenter dryers and heat-dried.

From tests carried on under operating conditions over a period of three years, the following conclusions may be drawn regarding the factors influencing the performance of centrifugal dryers handling coal:

1. Centrifugal drying is economically satisfactory. It is possible to lower the moisture of minus ⅜-in. coal to 5.0-6.5 per cent moisture, depending on the following factors: (a) size characteristics of the feed, (b) quantity of minus 48-mesh material in feed, (c) percentage of moisture in the feed, (d) amount of screen surface, (e) size of hole in screens, (f) extent of beds on screens, and (g) feed tonnage. Centrifugal dryers give a continuous method of dewatering to a lower moisture content than any other mechanical process. The increase of rotor speed over a certain optimum increases the horsepower and decreases the moisture content of the product only slightly.

2. The dryers reduce both ash and sulphur in the product compared with the feed. The top sizes (plus 48-mesh) increase in ash and the finer sizes (minus 48-mesh) decrease in ash in passing through the dryer, due to the breakage of the low-ash, friable material from the top sizes, leaving the harder high-ash coal. The high-ash fines in the feed pass out with the effluent, together with the fines produced from the more friable coal, thereby producing a lower ash in fines in the effluent than the corresponding sizes in the feed.

3. The principal problem in centrifugal drying of washed coal is the treatment of the effluent: (a) Handling and treatment influences the washer operation and the chemical and physical characteristics of its fine products. (b) The centrifugal dryer acts as a cleaning unit for the minus 48-mesh material in the feed. The high ash and sulphur pass off into the effluent. (c) The amount of effluent depends on the size of hole in the screen plates, the amount of screen surface, the quantity of minus 48-mesh material in the feed, the quantity of moisture in the feed and the area of screen surface covered with fine coal or bed material.

4. There is breakage of the plus 4-mesh material, which reduces the economic value of the fuel. A centrifugal dryer, to be satisfactory, should have practically no breakage of the plus 4-mesh material and future designs should concentrate on this factor, or perhaps it would be simpler to confine centrifugal drying to coal passing through a plus 4-mesh or ⅜-in. screen.

Mention may be made of the help rendered by the management, supervising and operating staff of the Pittsburgh Coal Co., whose efforts and compiling of data made possible the publication of this article.

Safety and Efficiency Go Hand in Hand At Allegheny Pittsburgh Mines

(Concluded from page 446)

H. F. Webb, general safety director, West Penn Power Co., reports on outside safety, and the electrical department of the same organization on electrical conditions conducive to safety. The management has been at much pains to discover a naphtha that will burn in flame safety lamps without smoking the glass and which will give a clear indication of the presence of gas. It has found an oil having the desired qualities. A weekly report of the presence of gas as determined by a methane indicator is made by the safety engineer, this report covering gas found in rooms as well as in the returns of all sections and in the main return.

In case of an accident, statements are taken from all eyewitnesses, and from the injured man if able to make one. Written statements are required from the section foremen, assistant mine foreman, mine foreman and superintendent with suggestions for preventing a recurrence of such accidents. Record is being kept of all penalties imposed for violations as a means of ascertaining whether an excess of accidents occur where discipline is rarely administered.

G. R. Kennedy, medical director, has his office in the building containing the lamphouse. This was chosen as the most advantageous location for the doctor, as each employee must pass through the lamphouse twice daily. He makes three trips daily to the office and is present when the men leave their work, so that any minor abrasion or cut that might result in infection may be treated. Each locomotive has a first-aid kit identical with that furnished motorcycle police. The motorman reports every evening if anything from within it has been used, and such material as has been removed is replaced before the locomotive goes out. This assures the prompt supply of first-aid material in good condition at all points and eliminates the looting of supplies so common when other methods of distribution are used.

A thorough examination is made of all new employees, in which urine, sight, hearing and blood pressure are tested, hernias noted, Wasserman test is applied and the physical condition of all would-be employees is recorded. West Penn chemists test the village water supplies at frequent intervals. Inspections are made also by J. M. Connor, general superintendent, and D. F. Welch, chief mining engineer, on whom the charge of this property and that of the Windsor Power House Coal Co. rests.

NOTES
From Across the Sea

IN GREAT BRITAIN, as in Belgium, some are to be found who believe that, where both intake and exhaust shafts are used for hoisting, the fan should be installed below ground, but some would go further and supply each split with a fan so as not to burden the whole mine with an excessive pressure, solely for the purpose of passing air through the most resistant split. At the same time they would furnish the mine with a fan on the surface capable of ventilating the entire mine effectively should there be a disaster. At one Belgian mine, says *Colliery Engineering*, 546 brake horsepower was being used by the surface fans, but on adoption of an underground fan system a saving of 350 brake horsepower was made, which, with current at 1c. per kilowatt, paid off the entire cost of fans and motors in 18 months.

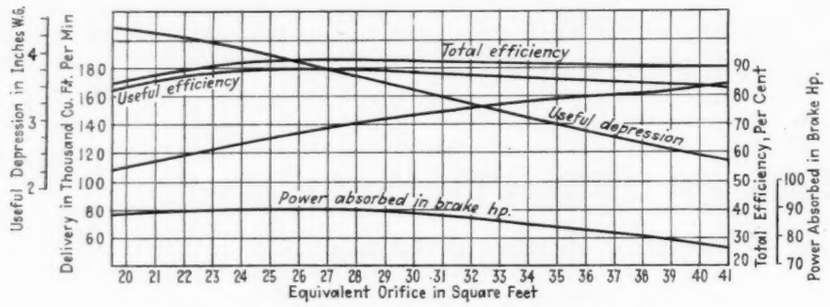

Fig. 1—Characteristic curves of the Aerex mine fan

With the Aerex fan (see *Coal Age*, October, 1933, pp. 344-345) the horsepower required is greatest when the efficiency is greatest and decreases slowly in either direction. Hence the motor can never be overloaded if the equivalent orifice increases or decreases, declares the same article. Short-circuits and increased resistance both decrease the power required. The characteristic curves are as shown in Fig. 1. No bypass is necessary because, when the fan is standing, the air will pass through it with little resistance and the fan can be cleaned in two hours. Passage of the dust-laden air does not erode the fan because the air does not receive any rapid change in direction and therefore has no erosive action.

THAT the anthracite of South Wales is cleaner than the bituminous coal of that area has caused to arise a theory that anthracite has a different origin from bituminous coal. But sometimes—not infrequently, indeed—anthracite is dirtier than bituminous, and the theory then goes aglimmering. Some of the Irish anthracite is quite clean and some is exceedingly dirty.

Prof. Henry Briggs, discussing "Alterations of Coal Seams in the Vicinity of Igneous Intrusions," before the Mining Institute of Scotland, had a new idea that fits quite nicely with the fact that anthracite as a whole is normally cleaner than bituminous coal—if indeed it be a fact, which many will deny vigorously. He declared that anthracitization (he termed it "anthracitation," by the way) generally involves a decrease in the ash percentage. Experiment shows, he declared, that an appreciable part of the mineral matter of coal can be dissolved by water at 100 deg. C.

Carbon dioxide may be found in maturing coal of every rank, and its aqueous solution is an effective chemical agent; at ordinary temperatures it converts silicates to carbonates and then dissolves the latter. Thus during anthracitization, said Professor Briggs, a coal was (or should he have said "may have been"?) subjected to an automatic cleansing process.

In comment it may be said that this statement may be true, but in some sections of the anthracite region of Pennsylvania it appears that the solvent action of water is more recent and comes from surface waters, because more ash is found in the lower than in the upper beds. It seems strange that cool surface waters have been more effective in removing ash than the hot carbonated waters of earlier years. Is it to be assumed that this coal received merely a dry distillation in the anthracitization period and so received none of the cleansing action of hot carbonated waters? But if coal thus submits to cleansing, why not clean it as far as possible by float-and-sink or washing methods, grind it and treat it with hot water containing carbon dioxide and use the "pure coal" thus obtained for some or all of the many purposes for which a pure carbon is desired? The possibility of dissolving the ash in coal has been none too closely canvassed. There are some uses for which a pure coal is so desirable than it should be worth all it would cost.

EVERYONE admits, declares the *Annales des Mines de Belgique*, that, because of its lack of oxygen, methane asphyxiates, but Dr. Hautain, who had examined many persons asphyxiated by firedamp, came to the conclusion that methane is poisonous or an anaesthetic and acts by a paralysis of certain nerve centers. Charged with preparing a report on this subject for the Congress of Industrial Diseases, Brussels, 1935, Dr. Hautain solicited the help of the National Institute of Mines in making experiments to determine this controversial point.

Guinea pigs, mice, little birds, a dog weighing 12 lb. and one weighing 29 lb. were used in these tests, which were made with Belgian mine gas in concentrations of not more than 36 per cent methane, then with coke-oven gas carefully freed of hydrogen and carbon monoxide and analyzing 70 to 72 per cent methane, and lastly with Saar firedamp containing 92 per cent of methane. For comparison, experiments were made also with nitrogen and hydrogen —inert gases.

Despite the facts advanced by Dr. Hautain in support of his belief, the investigators concluded that methane is inert and not poisonous. The experiments showed, however, what a small oxygen content sufficed to sustain life in the bodies of animals. The smaller dog rested for eight hours without any discomfort in a glass inclosure, breathing gas from the Pâturages gasometer, which has 8 per cent of oxygen, 36.6 of methane, 54.76 of nitrogen and 0.64 of carbon dioxide.

One is astonished, says Professor Breyre, the administrator general of the institute, that animals can continue to live in such high percentages of inert gas when one recalls with what rapidity men fall in methane mixtures, notably in face workings without a return airway, but, under such circumstances, he adds, the methane is concentrated and does not readily diffuse itself into the surrounding air.

BELGIUM divides its mines into four groups for administrative purposes: those without gas; those of the "first category," which are slightly gassy; those of the "second category," which are gassy; and those of the "third category," which are subject to spontaneous outbursts. In the table he submits the quantity of methane per short ton of coal extracted is given for several of the Belgian mines as stated in the *Annales des Mines de Belgique*. Professor Breyre calls attention to the insignificant quantity of methane in the discharge of the Bois de Cazier mine as being out of line for a mine having sud-

den disengagements of gas, and remarks that the discharge of gas from such mines is extremely irregular.

HYDROGEN does not form any sensible percentage of Belgian firedamp, declared Louis Coppens, doctor of chemical science, in the same publication, despite all that has been surmised. Of 21 analyses recently made, only two show any hydrogen whatsoever; one shows 0.017 per cent; and one, less than 0.003 per cent. All the analyses obtained show some ethane (C_2H_6), which in this country is regarded as an unfailing sign of leakage from a gas well, but these percentages in the tests recorded are quite small and run from 0.005 to 0.164. Methane percentages range between 15.07 and 99.39; nitrogen plus krypton plus argon, between 0.25 and 10.62; carbon dioxide plus hydrogen sulphide, between 1.117 and 84.02; helium plus neon, from less than 0.002 to 0.169; and oxygen, from none to 1.39.

Says Dr. Coppens: "The results of the tests made of our coals have shown that the adsorbent power is before all a function of the degree of evolution of the coal and not of the peculiarities of its stratigraphic position, as might be supposed." He declares that when coal has 20 to 22 per cent of volatile matter it has a normal adsorption, but when it has less it takes up a far greater quantity of gas. Significant indeed, he declares, is the fact that no mine with coal having more than 22 per cent of volatile matter has sudden outbursts, but those with coal having less exhibit these phenomena.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Where no price is appended in the notice of a publication of the U. S. Bureau of Mines, application should be directed to that Bureau. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Contributions to the Study of Coal — Proximate Analyses and Screen Tests of Coal-Mine Screenings Produced in Illinois, by L. C. McCabe, D. R. Mitchell and G. H. Cady. Report of Investigations, No. 38, Illinois Geological Survey, Urbana, Ill. 30 pp.

Investigation of coals from many points in Illinois as reported in this publication show that the dry B.t.u. value in the sized screenings, with one exception, is highest in the largest size and lowest in the minus 48-mesh or in the 10x48-mesh sizes. Ash is the most important factor in these variations. The usual relatively high unit coal B.t.u. value of the smaller sizes is probably due in part to their relatively high fusain (mineral charcoal) content. The high fusain content of some of the minus 48-mesh fractions is indicated by their high fixed-carbon values. Unfortunately, the ash (dry basis) in the screenings exceeds the ash of face samples from 0.5 to 12.9 per cent, which indicates either that the screenings contain a concentration of the impurities present in the bed or that roof and floor materials have been introduced. Both conditions may exist.

The highest ash percentage is in the two smallest sizes (10x48-mesh and minus 48-mesh). In eight of the mines sampled the minus 48-mesh contained 4.1 to 27.1 per cent more ash than the screenings from which it was taken. Eliminating, however, sizes below 10-mesh would lower the ash content of the screenings inappreciably. Sulphur percentages vary from one sized fraction to another, but, in contrast to ash, they frequently diminish in the finer sizes.

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The Rehabilitation of Oklahoma Coal-Mining Communities, by F. L. Ryan. University of Oklahoma Press, Norman, Okla. 120 pp., 6¼x9¼ in. Price, $1.50.

In this excellently printed, well-written volume is recorded the plight of the Oklahoma miners who produced in 1920 twenty-three million dollars' worth of coal and in 1934 only three million dollars' worth—a trifle more than in 1933. Output dropped from 4,839,288 tons in 1920 to 1,102,115 tons in 1933. A process of liquidation has been in effectual operation in the interim; the population of the Oklahoma coal communities has fallen off over 42 per cent, and the number of miners employed, 51 per cent. According to the author: "Many of the young and vigorous men left the coal fields for occupations in other localities. The expanding automobile and rubber industries absorbed former miners from Coalgate and McAlester. More than two hundred Italians from Krebs migrated to Akron, Ohio; a number of miners went to California during the 1924-1927 strike and found occupations in various industries around Los Angeles; and many of the American miners, foreseeing the failure of the strike, secured work as truck drivers and as machine operators in Oklahoma City, Tulsa and Muskogee. After 1927 there was a striking lack of men between the ages of twenty and forty in the coal communities."

But, although the population is thus finding its way to greener pastures, and the older members of the coal communities alone remain for the short remaining period of their active life, the author apparently cannot see that nature is correcting an unfortunate condition in the ordained way and wants a measure of socialism that would hold the rest of the inhabitants at these mines where the coal is thin, where oil and gas are plentiful, but where, according to this volume, homes are not of the best and the country has been spoiled by underground mining and stripping, and where conditions of life are surely no better than—if as good as—in the other parts of the United States.

Apparently most of them have no homes of their own, renting houses long in disrepair. Temporarily they are in a dilemma; the field in which they find themselves provides no living, and the rest of the country offers no jobs. So the author would nationalize all the Oklahoma coal fields—Indian and owned by private individuals—would construct two large electric power plants at the coal mines, to be run by the government, and also would provide collective cooperative farms in place of the present tenant and share-cropper system and in place of the heavily mortgaged individually owned farms. Thus no one is to take his medicine but the coal operator, who has made the largest investment of them all. — R. DAWSON HALL.

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Review of Literature on Effects of Breathing Dusts With Special Reference to Silicosis. Part II-B, Chapter 4, Prevention of Dust Diseases, by D. Harrington and Sara J. Davenport. U. S. Bureau of Mines, Information Circular 6848; pp. 119-210; mimeograph.

This review of the literature on the prevention of dust diseases covers engineering and medical control and general recommendations for control of dust diseases in industry. It describes several forms of dust traps and the construction of filters and quotes Thomas Ashley, a British inspector, who advises reducing shotfiring to a minimum and consequently number of shotholes drilled, keeping drills sharp, maintaining area near shots as clear of dust as practicable, proportioning explosive to work to be done, proper placement of shotholes, use of moist sand and clay stemming, firing shots between shifts, more efficient ventilation when drilling and loading rubbish in cars, fixing a definite interval between shotfiring and return of workmen, collecting drill dust while drilling by dust traps, water-fed drills and by use of foam. In this connection it may be said that clay stemming is to be reprobated as likely to cause blown-out shots.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Placing Feeders in Pump-Discharge Column Saves $600 in Installation Cost

APPROXIMATELY $600 in installation cost was saved by placing the feeder cables inside of the water discharge column at a new pumping station completed early this year at a shaft mine of the Koppers Coal & Transportation Co., Glen White, Raleigh County, W. Va. An increasing quantity of water—the ratio is now 10 to 12 tons of water per ton of coal—was the reason for installing the new pumping plant, which is situated in an underground room approximately 600 ft. from the bottom of the hoisting shaft and 295 ft. below the surface. The water is slightly alkaline and therefore corrosion of equipment was not a material factor in design.

A 15-in. borehole cased to 12 in. was decided upon as the proper size of discharge column to take care of present and future requirements. To accommodate the electric feeder lines a 3-in. pipe or conduit would have been necessary, and if a separate borehole was made for this feeder conduit, the hole would have had to be drilled 4 in. in diameter and would have cost approximately $2 per foot.

Successful operation of an earlier installation wherein the feeder cable conduit was placed inside of the discharge column led to its consideration for this new job. Calculations indicated that the power-increase effects of diminished water-carrying area and added surface friction would be so small that no increase in size of the discharge column would be necessary.

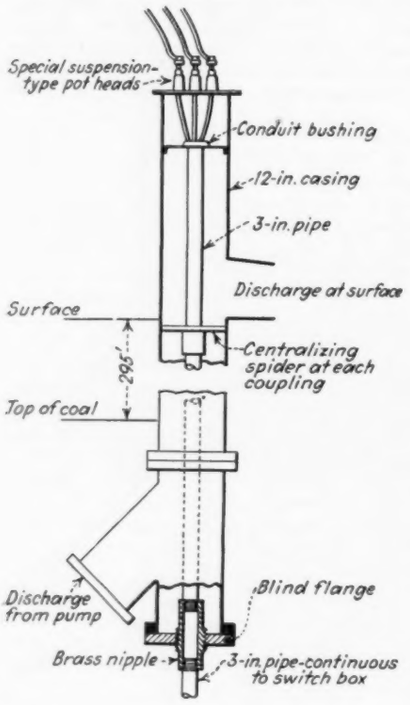
Three-inch galvanized steel pipe was selected for the conductor conduit to be placed inside of the 12-in. casing. The bottom end of the casing was fitted with a 45-deg. lateral tee and the "straight," or lower, end of this tee was closed with a blind flange that had been drilled and threaded to accommodate a 3-in. brass nipple 15 in. long. This nipple, which is threaded inside and out, is screwed into the flange and acts as a coupling sleeve for the 3-in. conduit.

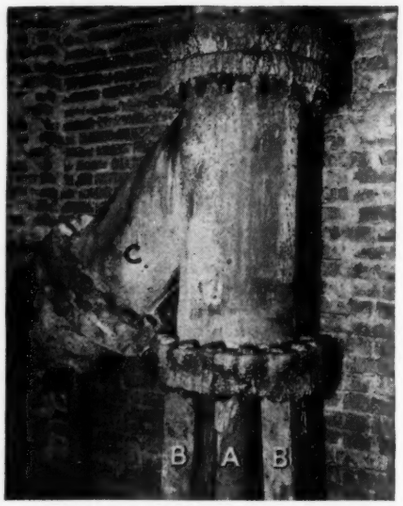
As the conduit was assembled and lowered into the casing from the top, lightweight spiders of three-leg design were placed above each coupling (20-ft. lengths) to prevent possible vibration or movement due to eddies in the water flow. Above ground, the conduit was terminated by a bushing resting on a plate supported by lugs on the inside and near the top of the casing. When the electrical feeder, consisting of three single-conductor, No. 4/0 stranded cables, was installed the conductors were terminated at suspension potheads mounted on a brass plate which closes the upper end of the casing.

Other specifications of the cables are: insulated for 4,000 volts; 9/64-in. 50-per-cent water-resisting rubber; tape, single braid, weatherproof and flame-resistant; 1.02 in. outside diameter. The power, which is generated at the mine, is 25-cycle and at present the cables are operated at 440 volts because a motor of that winding was available to drive the new pump and there also were available transformers to reduce the generated voltage from 6,600 to 440. If some time later the capacity of the pumping station must be increased the voltage may be changed to 2,200.

For present pumping requirements there was purchased a new DeLaval two-stage centrifugal pump rated 2,000 g.p.m., 320 ft. head, 1,600 r.p.m. The motor, which came from the company's stock of spare or surplus equipment, is rated 200 hp., 485 r.p.m. Connection to the pump and speed

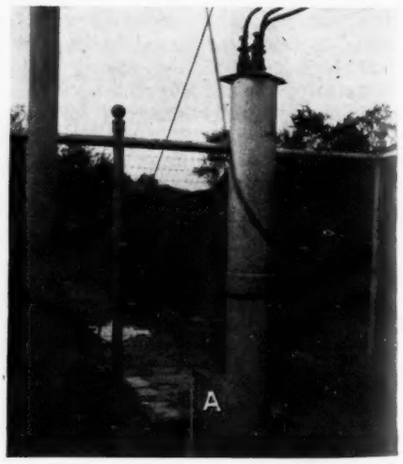
Schematic drawing of discharge pipe and conduit

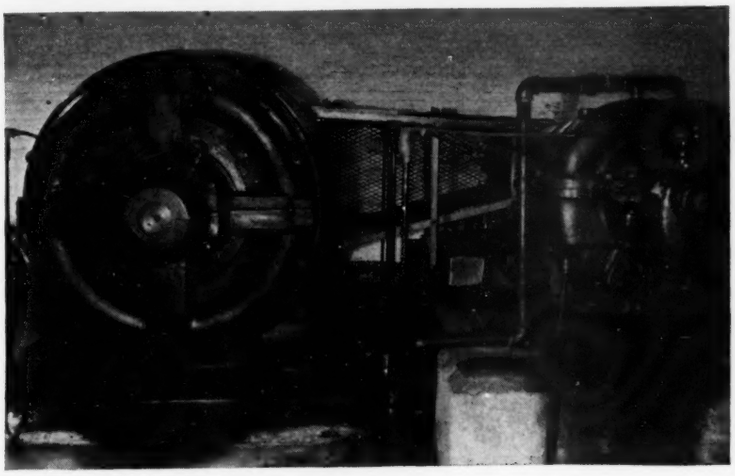




"A" is the electrical conduit; "B" are construction supports left under the discharge column; and "C" is the discharge pipe from the pump

"A" is the water-discharge opening below the pothead





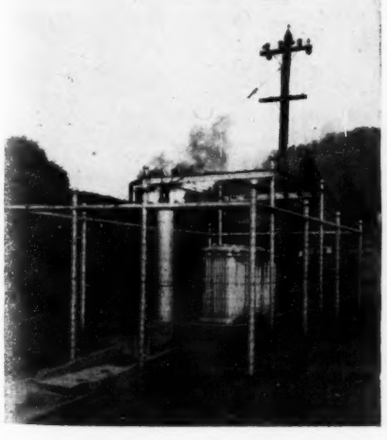
A 200-hp. motor drives the new pump

increase were effected by a Texrope V-belt transmission consisting of twenty-six $\frac{7}{8}$-in. belts operating on 31- and 11-in. grooved pulleys. At the nominal frequency of 25 cycles this pulley ratio would not bring the pump to full speed. However, the power-plant generators are operated at an overspeed which results in approximately 27 cycles.

Because the station is close to the main shaft, manual control was selected. Columbus thermostats set at 90 deg. C. protect the pump and motor bearings and a contact-making vacuum gage stops the pump in case of loss of water.

The Glen White borehole cable installation suggests the possibility that the conductors themselves might be placed inside the water-discharge column without the protection of a conduit. Rubber insulation sufficiently water-resistant is available and at depths not excessive there should be no great difficulty in designing a packing gland which would effect a proper seal at the bottom. If vibration of the cable due to water flow should cause difficulty it is possible that positioning clamps or guides could be installed in the casing to restrict the movement.

Transformers are installed close to the borehole in which the electric cables are "water cooled"



Tie Stops Cutter Derailments

The problem of operating heavy slabbing machines on balled rails was solved in at least one instance by the use of a special tie of simple construction, states Walter Iman, Kitzmiller, Md. Wooden ties were in use and, as is frequently the case, rails laid on their sides were used to make temporary track extensions by sliding them up to the face. As it was difficult to spike the slide rails solid enough to resist the side pressures exerted by the machines while cutting, derailments, caused by the rails slipping or turning over, were frequent. Consequently, the tie shown in the accompanying illustration was developed and each loader was supplied with two for installation in the track at the point where the machine stood while cutting. The special tie was made by nailing lengths of 2-in. plank to the standard 3x5-in. tie, leaving two slots of the proper size and at the proper gage to fit the rails.

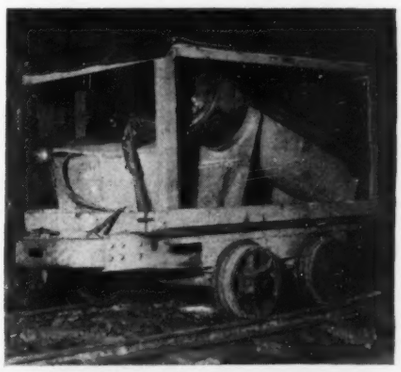
Construction of special tie

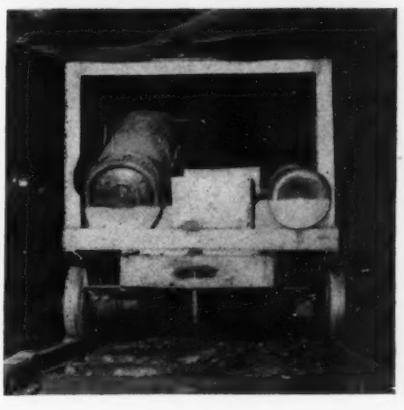
Oxyacetylene Tank Truck Facilitates Repairs

To facilitate the repair of loading and cutting machines and other equipment, and for general maintenance work underground, a northern Indiana mechanical-loading mine has adopted the oxyacetylene tank truck shown in the accompanying illustrations for transporting gas tanks and cutting and burning and welding equipment. So useful have these trucks been found that a total of three have been built and installed. As a basis upon which to build, the company purchased a number of flat-bed industrial trucks at a few dollars each.

At the shops, the original gage was extended and the inclined cradles (made of steel plate) for the tanks were installed. As the tanks could not be set vertically, as recommended by the oxyacetylene manufacturers, the principle of inclining them as much as underground conditions would permit was adopted. Each truck is equipped with a box set crosswise at the rear of the tanks to hold the gages, torches, tools and other accessories while the truck is being hauled from place to place or is on the sidetrack waiting for

Two views of tank truck





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Short Circuit

WHILE short circuits generally lead to trouble, trouble itself can be short-circuited with profit to all concerned. Short-circuiting trouble, however, requires some knowledge of possible means plus ability to put them into effect. This department cannot, of course, supply the ability but it does attempt to present a carefully sifted list of both preventives and remedies originated by operating, electrical, mechanical and safety men throughout the coal fields of the country. Your method of short-circuiting trouble belongs in these pages, so send it in. A sketch or photograph may help in making the idea clearer. Acceptable ideas are paid for at $5 or more each.

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a job, and an additional box is built in at one end to hold sand for use in case of fire. The sand box is in addition to a standard chemical fire extinguisher mounted on the truck. All the necessary wrenches for use on the gages and tanks are chained to the truck to prevent loss and reduce the tendency of electricians to use their pliers.

To guard the tanks from electric arcs resulting from fallen trolley wires or wrecks, a heavy steel framework is built over the tanks. On this framework is a wooden top and over all is a piece of old rubber conveyor belt for insulation. The trucks are equipped with 12-in. wheels on a 30-in. wheelbase, and are painted a bright yellow in order to make them more visible underground.

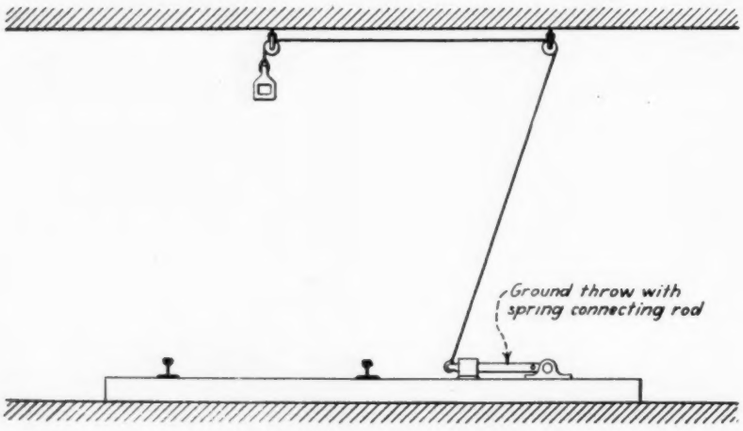
With these trucks, all equipment is concentrated in a single unit with ample provision for its protection, and is easily transported from place to place. Labor, trouble and delay in loading and unloading tanks from mine cars, particularly in low places, are eliminated, along with the hazards arising out of this particular task.

Auxiliary-Cable Throw Speeds Haulage

To facilitate main-line haulage by eliminating many of the disadvantages growing out of the customary method of throwing switches, W. H. Luxton, Linton, Ind., suggests the use of the auxiliary-cable throw shown diagrammatically in the accompanying illustration. It is generally impracticable, Mr. Luxton points out, to keep an attendant constantly on duty at each switch, and under many conditions this arrangement, which, he states, is past the experimental stage, will eliminate stopping the trip, with consequent loss of time and increase in power demand, as well as the dangerous practice of tripriders jumping off to run ahead to throw switches.

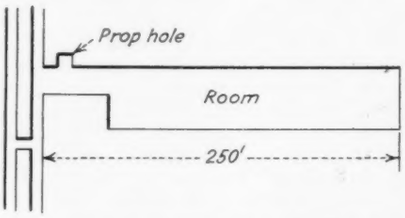
The cable is used in connection with a throw with a spring connecting rod ("spring switch"), and is passed over pulleys to a point over the center of the track, where a suitable pull, such as an old shovel handle, is attached. The switch for the district to which the next trip will go is thrown by the motorman as he passes the switch on the way out by grasping the shovel handle and giving it a sharp pull. The cars in the trip trail the latches until the trip is past, whereupon the switch is closed by the spring. Such switches, Mr. Luxton points out, should be kept clean and lubricated often enough to keep them working smoothly.

Switch is thrown by a pull on the handle near the top



Supply Loss Reduced By Prop Hole

In handling materials and supplies at the Reid mine of the Reid Coal Co., Inc., Timblin, Pa., it had been the practice to send props, caps, steel ties and other materials required at the face into each place in mine cars during the working shift, reports James Thompson, foreman. Under this system, each miner was required to unload the materials from the car before filling it with coal. Consequently, there was no designated place for unloading and it was found that the miners habitually ordered supplies for a week or two and unloaded them just as close to the face as possible. This frequently happened even when only a few more cuts were required to finish a place, with the result that such materials were subject to loss through being covered up by caves caused by pillar-robbing in case day men were unable to reach them in time to move them back—an additional item of expense aside from the question of possible loss.

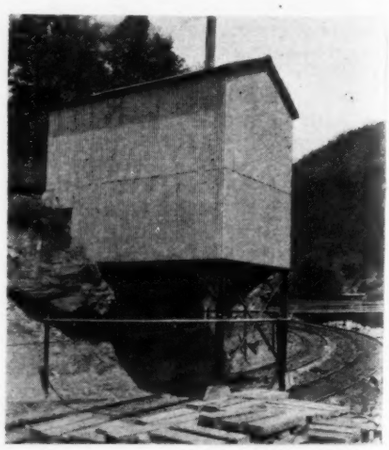


Prevents loss of materials and cuts cost

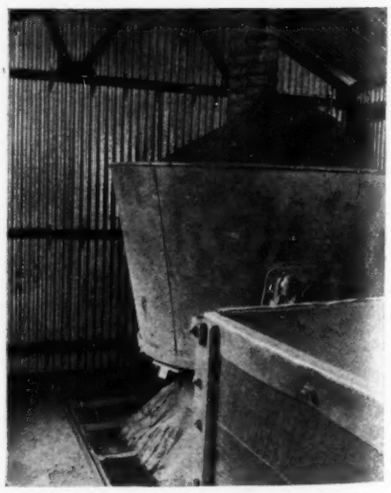
To eliminate these losses, a prop hole is now cut in every room. This prop hole is 6 ft. wide and 6 ft. deep, and is cut immediately inside the room neck 6 ft. from the heading. All timbers, caps, ties, etc., are now unloaded into the prop hole and only sufficient supplies to last one shift are taken to the face at one time. Thus, if the place should cave, the unused materials are in a safe place on the entry where they can be reached readily. Also, officials in making their daily rounds can easily determine whether the miner has on hand sufficient props and caps to comply with the mine law. One effect of this system has been a noticeable reduction in the mine-supply cost.

New Layout Cut Sand Job To a Minor Item

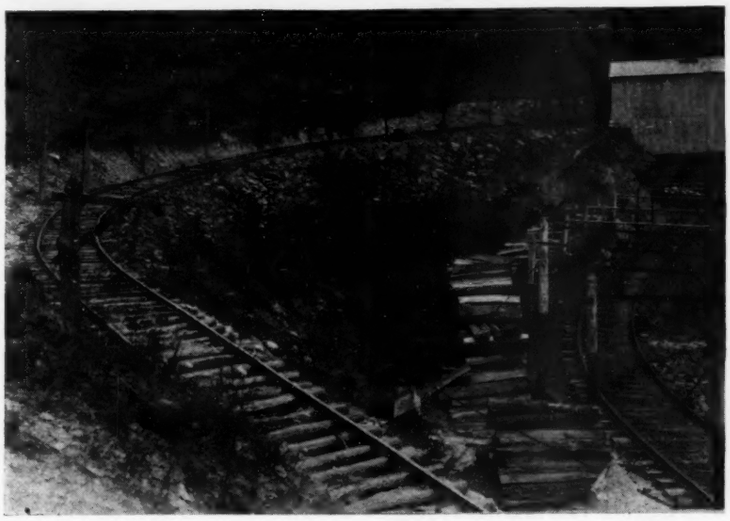
Over thirty man-hours per week is the labor saving effected by a new sand house built recently by the Mary Helen Coal Corporation at Coalgood, Ky. Formerly one man was employed full time at the sand-drying job and the arrangement re-



Locomotive delays were reduced by this modern sand filling station



Shoveling the sand from the mine car into stove hopper completes the handling



Up a steep grade the spur track at the left leads to the sand-house floor level

quired handling the sand twice after it had been shoveled from the mine car into the sand dryer. With the new layout no handling is necessary beyond the dryer, and the comparative labor expenditure amounts to approximately four man-hours per week. An additional advantage is less delay to locomotives when having the sand boxes filled.

As indicated by the illustrations, the new sand house includes a hopper-bottom steel bin positioned below the drying stove but directly above the main haulage track leading from the mine portal to the tipple. Advantage of the hillside was taken to support one side of the hopper structure and to provide an approach track of grade within the ability of a trolley locomotive to haul up a car of fuel or sand.

The hopper of the sand-drying stove has a capacity of two tons. Dried sand flows through a floor-level screen which catches all oversize materials. The storage bin, which has a capacity of 14 tons, has two hoppers in the bottom and each hopper is equipped with a flexible sanding hose.

Construction consisting of steel framing, corrugated metal covering and concrete flooring makes the job fireproof. Coal for fuel is stored in an outside bin a few feet from the sand house.

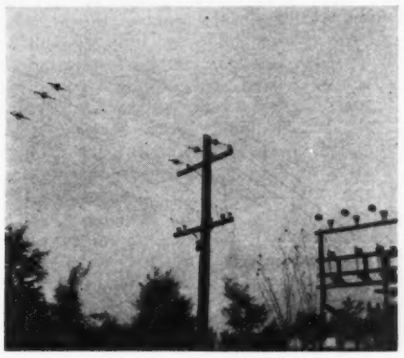
Reservoirs for Babbitted Bearings

The use of reservoirs cast in the bearing metal at the time of pouring is suggested by John E. Heyler, Peoria, Ill., as a possible solution for heating, particularly where the bearing is likely to be left for long periods without lubrication. In casting the reservoirs, strips of soft wood or leather approximately the size of the reservoirs desired are positioned about the shaft, with the shaft resting on them, so that when the babbitt is poured, the spaces occupied by the filler strips will be kept free from the metal. Notches can be cut in the strips at intervals of ½ to ¾ in. to allow unrestricted flow of the babbitt to all parts of the bearings.

When the babbitt has cooled and the shaft has been taken out, the strips of wood or leather are taken from their places. The reservoirs thus formed are then filled with strips of good-grade felt. The various reservoirs are connected with the oil grooves so that the lubricant can pass from one to the other in the direction of rotation. The felt strips in the reservoirs will retain lubricant for a much longer time and will distribute it more evenly than ordinarily is the case, Mr. Heyler states in pointing out that this method is unusually good in the case of bearings that have proved troublesome.

Redesigned Hairpin Connection Offers Greater Protection

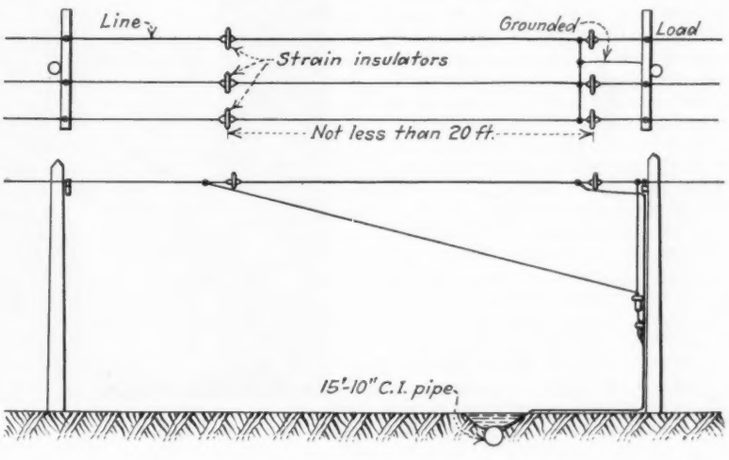
Considerable difficulty in securing adequate protection against lightning discharges has been experienced in mining regions, in large measure due to difficulty in securing good grounds because of extreme dryness of the ground resulting from the rapid drainage through fissures in the rock after the coal has been mined out. The hairpin method of connecting lightning arresters in the circuit, redesigned by J. F. MacWilliams, electrical engineer, Pennsylvania Coal & Coke Corporation, has been used with very good results, reports E. J. Lynch, power department, of the same organization. As shown in the sketch, such a method provides a separation of at least 20 ft. between the incoming line and the line entering the substation, with the lightning arresters connected in the circuit at the low point of the loop and the dead section short-circuited and grounded, thus practically insuring their operation.



Redesigned hairpin connection in service

"With this system, the importance of good grounding cannot be too strongly emphasized. A grounding system that has been used with good success is based on the use of approximately 15 ft. of 10-in. cast-iron pipe for each ground buried in the dampest territory available, even if at some distance from the arrester station. The bed of a small creek, temporarily diverted, makes an ideal location for such a ground. One good ground, though more expensive, is better than a number of cheaper, though not as effective, grounds. The use of strain insulators at both ends of the supporting wires in this method of connection is very important, as otherwise the separation obtained would be only the length of the strain insulators used. Several such installations have been made by this company with very good results."

Details of hairpin connection for lightning arresters



WORD FROM THE FIELD

Fuel Sessions to Be Held At A.S.M.E. Meeting

At the annual meeting of the American Society of Mechanical Engineers, to be held Dec. 2-6 at the Engineering Societies Building, New York City, there will be several sessions holding interest for coal men. At the fuels session in the morning of Dec. 5 the following subjects will be discussed: "Factors in the Selection of Coal for Unfired Stokers," by a committee of fuels engineers representing Appalachian Coals, Inc., including R. L. Rowan, L. A. Shipman, T. H. Queer, K. J. Kasper, O. O. Mallers and J. E. Tobey; symposium on "Zoned and Metered Air Control for Underfeed Stokers," H. E. Macomber, A. S. Griswold and J. N. Landis. At the afternoon session the same day these topics will be covered: "The Life of Various Types of Furnace Bottoms for Tapping Ash in the Molten State," Rolfe Shellenberger; "Water-Cooled Stokers," J. S. Bennett and C. J. Herbeck; "Rheostatic Precipitators for Stoker-Fired Boilers," C. W. Hedberg.

RFC Loan to East Boston Co.

A loan of $326,000 to the East Boston Coal Co., anthracite producer, Kingston, Pa., was approved Oct. 9 by the Reconstruction Finance Corporation. The company's mines have been closed since Aug. 1, putting more than four hundred men out of employment, and about $1,000 in back wages is owed to employees.

Anthracite Week Observed

Colliery operators, United Mine Workers and organizations of business men in the hard-coal field of Pennsylvania joined forces in celebrating "anthracite week" Oct. 7-12. Organized primarily to foster interest in anthracite and to recapture lost consumers, the observance included a statement by Governor Earle indorsing its plans and purposes; mass meetings addressed by prominent speakers in various centers of the field; special programs in institutions of learning; circulation of petitions urging an increase in the duty on Russian coal from $2 to $5 a ton; and displays of anthracite burning devices in windows of department and other stores, and in the lobbies of banks and elsewhere.

A follow-up program has been formulated by the General Anthracite Committee, formed for the purpose. Among its objectives are to persuade former consumers of anthracite to switch back to its use, such as post offices, army and navy bases, and government buildings in the hard coal region. Efforts also are to be made to have CCC camps in the northeastern section of the country use hard coal. The convenience of anthracite when used with modern automatic equipment will be emphasized, and local business men will be urged to give preference to those who use anthracite in making purchases.

R. E. Taggart Named to Head Reading Coal Co.

Ralph E. Taggart has been elected president and director of the Philadelphia & Reading Coal & Iron Co., effective Oct. 15. He succeeds Nathan Hayward, president, American Dredging Co., who took over the P. & R. presidency temporarily following the death of Andrew J. Maloney, last May.

Born 48 years ago in the Connellsville region of Pennsylvania, Mr. Taggart followed his father's footsteps in becoming associated with the Leisenring-Wentz interests in developing and operating coal mines. His first job was in the engineering department of the Virginia Coal & Iron Co., but later he became connected with the Stonega Coke & Coal Co., becoming vice-president of both, as well as of the Westmoreland Coal Co. and the General Coal Co., the last named a selling company. He has severed his connection these companies. Besides serving several terms as president of the Virginia Coal Operators' Association, he was instrumental in the formation and development of Appalachian Coals, Inc.

© Harris & Ewing

Ralph E. Taggart

Laboratory Tests Performance Of Soft Coal in Stokers

Performance of bituminous coal from various sections of the country when burned in automatic stokers is being tested in a fuels research laboratory set up at Battelle Memorial Institute, Columbus, Ohio, by Bituminous Coal Research, Inc. The program planned includes the determination of the relation of the size of the coal, quantity of ash, fusibility of the ash, quantity of volatile matter, and the tendency of the coal to coke to the performance of the coal in the stoker.

The illustration on the contents page of this issue shows three typical domestic stokers set in special furnaces which can be arranged to simulate either steam and hot-water or warm-air furnace conditions. Another furnace in the rear is available for comparisons with hand-firing practice. The control for the stokers, together with equipment for measuring drafts and temperatures, are centralized at the tables on the right. In the center is the apparatus for sampling and analysis of the products of combustion. The coal is weighed to the stoker hopper, the furnace and stoker assembly is weighed periodically to determine the rate of burning, and the air supplied to the stoker is measured. By these means it can be determined accurately what happens to the heat in the coal.

Thorough tests of the comparative values in cost of heating with coal, gas and oil in residences also are about to be undertaken by engineers at Battelle. The experiments will be made in fifteen frame and brick homes for hot-water, steam and hot-air heating, using low and high-volatile coal, both hand and stoker fired, as well as coke, gas and oil. The tests will continue for about 24 weeks. Oil and gas interests are cooperating in the experiment. Smoke-testing apparatus has been installed on stokers in the Battelle laboratory, and preliminary tests have been made.

On recommendation of Howard N. Eavenson, chairman, research program committee, John C. Cosgrove, president of Bituminous Coal Research, has named the following committee of combustion engineers to supervise its experimental work at Battelle: J. E. Tobey, fuel engineer, Appalachian Coals, Inc.; J. B. Morrow, preparation manager, Pittsburgh Coal Co., and John Fielding, Jr., Hanna Coal Co.

Illinois Institute Meeting Set

Subjects that will be discussed at the 43d annual meeting of the Illinois Mining Institute, to be held Nov. 8 at the Hotel Abraham Lincoln, Springfield, include the following: "Selling Safety," Paul Halbersleben, general superintendent, Sahara Coal Co.; "General Conversion Equipment for Mine Use,"

B. R. Connell, industrial engineer, General Electric Co.; "Fundamentals of Coal Cleaning," Henry F. Hebley, research engineer, Allen & Garcia Co.; "Coal Utilization (with Special Reference to Sulphur Content)," W. D. Langtry, president, Commercial Testing & Engineering Co. At the annual banquet George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., will be toastmaster, and J. D. A. Morrow, president, Pittsburgh Coal Co., will make an address on "The Spiral in Coal."

Safely—the Only Profitable Way to Operate, Slogan of National Safety Council

HOW TO DEVELOP an operating program which will capitalize on the close relation between efficiency and safety and will eliminate the haphazard methods which endanger those who practice them was the major theme underlying and unifying the discussions at the Mining Section of the 24th Annual Safety Congress and Exposition of the National Safety Council, at the Brown Hotel, Louisville, Ky., Oct. 15-17. Group meetings for each class of workers was urged by one speaker; that first-aid training increases safety was stressed by another; "weed out at the unsafe workers at the start," advocated a third. Safety, declared several, is the road to economical and profitable production; true appreciation of the money costs of accidents will spur management to action.

In preoccupation with the drama of the major accidents, too little attention has been given to the minor ones, and yet, it was pointed out, these minor accidents are responsible for the major part of the nation's annual tribute to unsafe practices and unsafe workers. Moreover, what causes an accident is more important than the class of accident reported. Frequently an accident which does not result in an injury is more significant than one which does because it gives forewarning of an unsafe condition crying for correction. Unless the number of accidents in a given period are checked against an accurate exposure record, it is impossible to have a true picture of progress in eliminating hazards.

Class Vs. Group Meetings

The idea of separate meetings for each class of mine workers was put forward by J. F. Daniel, chief, Kentucky Department of Mines and Minerals, at the opening session. Face workers, such as cutters and loaders, for example, should meet in one group; transportation men, such as motormen and trip riders, in another. By not attempting to cover the whole field of mine safety in a single meeting, it is possible in a shorter time to make a greater impression on men having a group interest than if the topics were more generalized. Inspirational general meetings also should be held, so that the part of all the men in the work of safety may be coordinated.

Mr. Daniel did not believe that the department should try to induce every mine to follow any specific organization plan, for personnel and conditions varied from mine to mine, and it was not well to upset any plan that was successfully developing the safety spirit and achievement by setting up a new organization and destroying what seemed to have fitted itself to local conditions and needs. He advocated model working places for the training of newly employed men and the appointment of instructors to train new arrivals at the plant in the safe way of performing their duties. He would have 100 per cent first-aid training, so that everyone would be available to tend the injured promptly and so that the safety spirit would be inculcated in the entire force.

First-aid training, declared N. P. Rhinehart, chief, West Virginia Department of Mines, increases mine safety. In Colorado, 20 per cent of the men had such training, said William Glennon, mine inspector, Kansas. Kentucky is the only State where the law requires that every mine employee have first-aid instruction, according to D. Harrington, chief, safety and health branch, U. S. Bureau of Mines. S. H. Ash declared that two States required that half the mine workers, at least, be thus instructed.

Stress Also Minor Accidents

That 7,000 men came to Louisville for the various sectional meetings of the National Safety Congress convinced Isador Lubin, commissioner of labor statistics, U. S. Department of Labor, that safety is one of the paramount issues of the day. However, too much stress is placed on major accidents. H. W. Hendricks, Travelers Insurance Co., places the cost of accidents major and minor, and their incidental losses at $5,000,000,000 annually, showing by this figure that small accidents are of great importance. These costs cover not only injuries to the employee but loss of time of other employees, due to the interest, helpful assistance and disorder that the accidents engendered, loss of time of foremen, time spent in investigation, making records, getting a man to replace the injured, training the man in the new job, injury to tools and equipment, spoilage and idleness.

A fall of material, continued Mr. Lubin, defines an accident rather than specifies its real cause, which cause may be defined as that which by its defect or position permitted or caused the material to fall. In fact, in recent years the public has been veering away from true causes for mere categorical statements as to classes of accidents. When there was no compensation law, all the stress lay on who was to blame—the employer, the employee or the fellow workman—for, unless it was the first, there was then no obligation to pay indemnity. So the question that was paramount was who was to blame, and first causes rather than the manner of accident stood first in the public mind. Gradually industry in its natural cycle is veering back to the determination of original causes, and this consideration is being grafted onto the compensation law as a needed provision.

All cases should be reported, contended Mr. Lubin, even if no time is lost thereby. It often happens that a mere fluke of position or the interposition of split seconds saves a no-lost-time accident from being a lost-time injury or even a fatality. All the potentialities for a substantial injury are there, even though none occurs. As we advance we shall make our accident cost accounting data as circumstantial and accurate as other cost accounting, and we shall find that the cost is far greater than has been thought.

With fewer days worked and shorter hours, said W. W. Adams, statistician, U. S. Bureau of Mines, the exposure basis of estimation of accidents has become more essential than ever. Accidents without injury, suggested R. D. Hall, engineering editor, *Coal Age*, were often more significant than those with injury. He instanced a case where a trip he was about to take ran down an incline and roofed, an unquestionably fatal accident had he been ready to climb aboard a few minutes earlier than he was. In reply, Mr. Lubin described a recent accident which destroyed an immense amount of property and cost the contractor far more than the cost to him of a fatality. Yet this "accident" did not result in a single employee losing an hour through physical disability to work. Surely the possible dangers to human life and limb should be viewed through the light shed by such accidents.

"Our company already studies such matters from that point of view," declared C. R. Kinzell, Phelps Dodge Corporation. The operating department has delay reports to explain losses in production, but the safety department also scans them diligently. If a cable gives way and lets weights fall it may be an accident to material only, but a different relation of the men to the material might turn it into an accident involving life or limb. Thus perusals of delays uncover risks that otherwise might be overlooked.

Checking the doctor's report, based on his inspection of the slightly injured, scraped or scratched man, with the report of the foreman, it probably was true that the Hanna Coal Co. was able to list 99 per cent of the trivial accidents, said William Roy, safety director. Classifications base each accident on a single cause, added Mr. Hall, though few indeed can be said to be so simple. The multiple cause of accidents should be recognized in the tables for determining the eliminating effect of removal of every cause, even though such tabulations would be misleading if added together and held to represent the possible savings of accidents from all causes.

Seven-Day Report Premature

Objection was registered by a member to the requirement in Oklahoma that reports of accidents be made within seven days. When the report was made, it might be found later that it was a fake claim which the operator's officials had permitted to appear on the record, and, try as they would, it was impossible to swear it off. To this end in Kansas, said another, the operator's report is not allowed to be presented as competent testimony at a subsequent hearing. At one mine the foreman fills up every man's rate card each night showing his wage rate and time. If the workman approves it he writes his initials on it. If the initialing is in blue, it signifies he was not hurt. If in red, it indicates that he claims an injury. Thus, not only time and wage but freedom from injury are testified by each man unless he has reason to claim otherwise.

Any man who is indifferent as to the

safety of his place is almost sure to be indifferent also to the quality of his product, declared P. C. Thomas, vice-president, Koppers Coal & Transportation Co., in an address presented by L. C. Campbell, his assistant. Discipline is regarded by the Koppers company not as a punishment but merely as a means of drawing attention to the necessity for compliance with rules, and this is the way in which it is expressed when putting discipline into force. For discipline to be successful it must be fully and sympathetically indorsed by the official who is in control of the subordinate official who enforces the discipline.

The best time to secure safety is when a man is employed, added Mr. Campbell. Too often are men engaged at the mines without careful selection. Every company should have a definite program for employment with careful physical examination. Another problem is to devise a program dealing with the superannuated man. Many companies introduce machinery into their mines without discussing its hazards, and wait for cripplings and fatalities to suggest the risks and the precautions that should be taken to eliminate them. Standards adequately blueprinted are better than rules. Too much timbering and a little waste in material and effort is advisable wherever such rigid and expensive precautions may save an injury or a life. When long hours were worked the men became fatigued and lost their ability to protect themselves against casualty. With shorter hours, he feared, haste to make a big wage in a short time was replacing fatigue as a menace.

Out of 2,148 cases of discipline administered, explained Mr. Campbell, 452 were for failing to secure or take down loose top and 1,652 for violations of the State mining law. One-day layoffs were ordered in 1,477 cases, 595 were three-day layoffs, and 67 men were discharged. J. L. Boardman, safety director, Anaconda Copper Mining Co., said that the accident rate was good so long as new jobs were difficult to obtain. If care is not taken, disciplines administered were not enforced. A foreman who needed a cutter or loader let him come to work, discipline or no discipline, said T. E. Lightfoot, engineer-in-charge, accident prevention and compensation, Koppers Coal & Transportation Co.; the only protection was an inspection of pay sheets, which sometimes would reveal that discipline was only a paper provision.

Accident Loss May Exceed Value

Code reports showed that the profits on the product of 178,000,000 tons last year were 2.7c. per ton. Casualties and their amelioration cost these companies 4.9c. per ton. If these costs could be halved by proper methods of accident prevention the coal companies could double their profits, declared J. T. Ryan, vice-president, Mine Safety Appliances Co.

Moral obligation to reduce suffering and death, remarked Mr. Harrington, had operated for centuries to make the operator provide for safety and demand it. But whatever it did to alleviate the burden on the worker and to reduce the accident rate, it could not or did not stem the tide. Despite all the recent improvement, he still held that casualties could be reduced 50 per cent.

Anaconda stock, said Mr. Boardman, once was worth $1,000,000,000 and now is worth $33,000,000. At the lower figure, and each man a possible fatality, costing $8,000 on death, the company faced a risk of loss exceeding the whole face value of the company's possessions every time the men entered the mines. If ever the company showed slackening interest in safety he could present this consideration as a conclusive argument, showing that, as a mere investment, safety was the paramount issue. Much as safety was a matter for emotional interest of the most intense character, it remained true, added R. N. Hosler, superintendent, compensation-insurance rating bureau, State of Pennsylvania, that no success in reducing casualities was attained until compensation was introduced.

Need for discipline also was stressed by Mr. Rhinehart, who emphasized instruction, advice and proper rules. In the anthracite region, said R. E. Kirk, safety engineer, Philadelphia & Reading Coal & Iron Co., antipathy and resistance to change militated against greater safety. Labor relations established prior to the decision of the Roosevelt Commission in 1902 and given repeated recognition in later contracts with the miners are still in full effect. Whatever change is made in methods has to be with the full approval of the miners, but, as they are intelligent men, they can recognize their interest in safety which provides for them their ability to earn a good living. Thus safety means more to them even than their rights under the contract.

With his company, therefore, continued Mr. Kirk, not discipline as ordinarily understood but instruction takes the upper place. That men should understand their hazards, that they should recognize the importance of safety not only in assuring comfort but their continuance in earning capacity both for their own advantage and that of their families are almost the only methods available to the company except such as had been established prior to 1902. However, hazards due to conditions chargeable to management, such as machinery, clearance, etc., could be and are being corrected. Hazards also can be reduced by the elimination or reduction of exposure of persons. Without means of enforcement, instruction must demonstrate an incentive such as the safety accompanying better methods or a larger product at lower expenditure for explosive or reduced effort per ton produced. Propaganda does not fit the anthracite region. The men are quick to resent it. However, he was convinced, progress could be made. He held conversion, though long and arduous, would succeed and be more lasting in its effects than compulsion.

Discipline of one man, said J. W. Alt, safety engineer, Calumet & Hecla Consolidated Copper Co., braces the whole organization. The fact that it has been enforced in one section travels over the whole mine and even filters to all the mines of the company. Unfortunately, some foremen will set about correcting bad conditions themselves instead of making the men correct them, standing by them till the conditions are corrected. Some bosses will bar down loose rock, gather up drills and other tools that should go to the shop, so that the men get to regard the matter as the boss' particular interest and not their own and leave it for him. They must be made to make provisions for their own safety and not regard the boss as a maid to tidy up their chamber.

His company sometimes gives small prizes to men for knowing what was on the bulletin board. It has a point system for demeriting bosses for bad conditions, and if they do not know what was on the bulletin board they get a small demerit. Men who distinguish themselves in promoting safety are given hard-boiled hats with an emblem at the side which attests such devotion. Such insignia are much prized. Fortunately, the company has an artist who can draw diagrams showing good and poor practices for use on bulletin boards. Frequently drawings were made captioned "What's wrong in this picture?," and three prizes were awarded for the three best answers. Shifts are given dinners when they have no lost-time accidents. Too much discipline is a sign of weakness.

Not a Fad but a Dividend

Safety is no longer considered a fad and a bar to production, declared Mr. Harrington at Thursday's session. Without safe operation there can be neither profits nor continued production. Much has been done to make production safe, but as fast as the safety man plugs one hole another has opened up, and if he does not work adroitly to meet the new hazards which managements are constantly introducing, the safety man will lose ground instead of gaining it. Explosions, explosive accidents and shaft accidents have definitely decreased.

Speeding up coal extraction by the introduction of cutters and loading machines has increased the quantity of both gas and dust, and, if not watched, will result in increased explosion fatalities, now so happily reduced. With more rapid extraction it has become increasingly customary to shoot the coal when the men are in the mine and to do it at all hours. The explosions in Great Britain at Gresford and other collieries show that the danger of catastrophes of that type are not removed. With multiple shifting, only one shift has adequate supervision. The higher officials cannot work two or three shifts, and the "graveyard shift" may readily become as significant in fact as in name.

Black blasting powder is being rein-

PERMISSIBLE PLATES ISSUED

FOUR approvals of permissible equipment were issued by the U. S. Bureau of Mines in September, as follows:

Goodman Mfg. Co.: Type 412-CL3 shortwall mining machine; 50-hp. motor, 220-440 volts, a.c.; Approvals 292 and 292A; Sept. 11.

Goodman Mfg. Co.: Type 412-CK3 shortwall mining machine; 35-hp. motor, 440 volts, a.c.; Approval 293A; Sept. 11.

Joy Mfg. Co.: Type 11-BU loading machine; 50-hp. motor, 220 volts, a.c.; Approval 294; Sept. 18.

Goodman Mfg. Co.: Type EA-10-82 shaker conveyor; 10-hp. motor, 230 volts, d.c.; Approval 295; Sept. 20.

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The following cable has been added to the List of Specially Recommended Cables: BM-27, Security Flex No. 3 twin cable (19x7 stranding).

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troduced, said Mr. Harrington. The newer blasting-powder cartridge is less likely to be fired by open lights than loose powder and therefore is the safer explosive, but it still fires gas and dust and is a menace to the miner. Blasting off the solid shatters the roof. If shots are fired by shotfirers when the men are out of the mine, the roof has time to fall before the miners came in, but if shots are fired in the day time the roof may fall on the men unless they are unusually watchful and bar down all loose material.

The tendency to leave the more difficult coal for another man to mine and to take only the room coal and a little of the pillars either at the end or by slabbing reduces accidents temporarily, but ends in bumps and squeezes, which in the long run increase hazards by wrecking the mine. Withdrawal of long-standing pillars may be reckoned among the more dangerous operations. During the War, accidents declined because only the "cream" of the coal was taken, but the mines today show the effect of this policy. Roof-fall accidents reached a peak in 1930. There has been progress in reducing such fatalities in certain mines with some companies, even in some States, but no nation-wide reduction. Records of local improvements in roof-fall fatalities show that progress is possible if companies will make it a consistent endeavor and approach the matter constructively.

"Death on the Rail"

Transportation accidents have shown no betterment. Heavier locomotives and cars and higher speeds often have been introduced without the installation of heavier rails, better ties, guards and frogs. In the War period, transportation accidents were high, but the peak was reached in 1929-34. During 1931, 1932 and 1934 the accident rate was lowered, but it is not unusual to have more transportation accidents per year than there are transportation men in the mine. These accidents are far more frequent than in the earlier years before the locomotive was introduced. Dangers in the rerailing of large cars are far greater than were faced when cars were smaller. Mr. Harrington believed that the trolley locomotive should be forbidden to enter the mine. He looked for the day when compressed-air, storage-battery and diesel-oil engines would undertake the entire transportation job.

Electric-contact accident rates are still high, and half the accidents are from the trolley wire. Not a foot of such wire, unless it is 7 ft. above the track, should be unguarded, declared Mr. Harrington. By careful operation accident rates can be cut one-half and perhaps three-quarters. There are two unsafe mines to one safe one. Records are now available to prove the financial profitability of safety. Henceforth, the safety man need no longer be on the defense; he can definitely take the offensive and have facts and figures on which to base his contentions.

Mechanized mines, declared Thomas Allen, chief coal mine inspector, Colorado, will decrease accidents. Hand loading had killed many men, making them old before their time. He preferred the conveyor type of mining with the duckbill, because the men are not exposed to roof falls, as when shoveling. The conveyor permits of a minimum unsupported space at the working face. Mr. Allen also favored mechanization because he thought all mining should be done on the retreat and because mechanism made it possible to drive rapidly to the boundary and work back, thus restricting mining to relatively solid coal.

Shortfirers in a mine are few and certificated. The inspector has the whiphand of such men and can compel them to do their work safely, but it is a difficult matter to control the actions of the entire face personnel. These shotfirers are better schooled men and, as they are paid by the company for their time, they are more ready to use the necessary safety precautions and material. The miner regarded shooting as a gift to the operator. Only shoveling brought him a return. So when he shot his own holes he skimped labor and material, and accidents occurred.

Accident costs at Hanna mines, said Mr. Roy, had fallen from 5.4 to 1.9c. per ton. Mr. Roy outlined the organization and functions of the Hanna mine medical societies (*Coal Age*, December, 1934, pp. 487-488). In 1934 these societies had 2,500 members, and their death rate was half that of Ohio as a whole. Before men were employed their physical condition was rigorously examined and unsuitable men were not hired, but the families of the men were not subjected to similar examination. Each doctor knew every member of the families under his supervision. If they needed attention an order was given to a specialist who decided whether an operation was required. It had been found that many men needed glasses. This plan has met the necessities of the situation admirably, and both men and management heartily commend it.

Improvement in both safety and health at the McIntyre-Porcupine mines was recorded by Angus D. Campbell, safety engineer and manager, Omega gold mines. Fatalities per thousand men per annum dropped from 3.36 in 1929 to 1.69 in 1934.

Men were examined by the provincial authority before being hired and, if free of pulmonary trouble, were thus certified. The company found quartz no worse than some other rock in its silicotic effects; however, some Ontario mining camps were worse than others. Men were not discharged who developed silicosis until it disabled them. The battle against that disease was being won; fewer cases were found. Wet drilling was universal. In stopes, the waste air of the drills furnished ventilation; in drifts, compressed-air was forced into the faces.

The company had a four-point program: (1) better ventilation, (2) wet drilling, (3) better health, (4) elimination of tuberculosis. Water sprays were used on rock to allay dust in shoveling.

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Safety Chiefs, 1935-1936

J. W. Alt, safety engineer, Calumet & Hecla Consolidated Copper Co., Calumet, Mich., was elected chairman of the Mining Section, National Safety Council, at the annual meeting held Oct. 15-17 at Louisville, Ky. C. W. Gibbs, general manager, Harwick Coal & Coke Co., Pittsburgh, Pa., was made first vice chairman; George Barrett, general claim agent, United States Steel Corporation subsidiaries, Duluth, Minn., second vice chairman; Lee Long, vice-president in charge of operations, Clinchfield Coal Corporation, Dante, Va., third vice chairman; Dan Harrington, chief, Health and Safety Branch, U. S. Bureau of Mines, secretary.

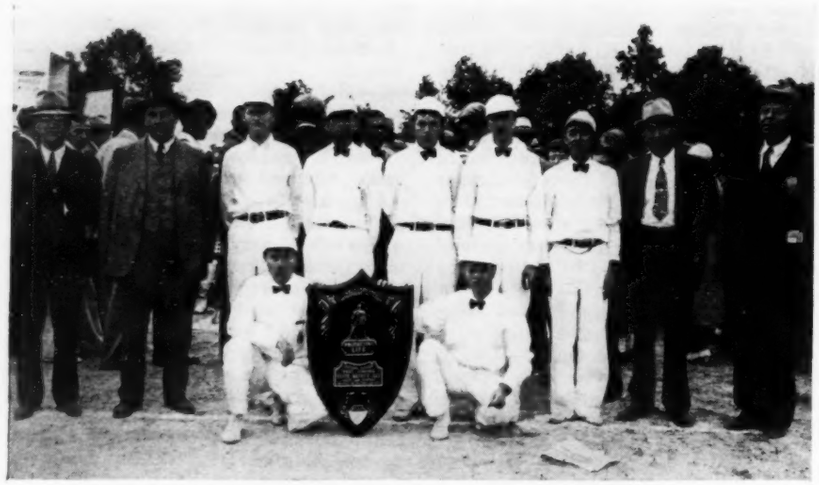
The new executive committee is composed of P. M. Arthur, director of personnel, American Zinc Co. of Tennessee, Mascot, Tenn.; W. H. Comins, local manager, National Lead Co., St. Francis, Mo.; T. E. Lightfoot, engineer-in-charge, accident, prevention and compensation, Koppers Coal & Transportation Co., Pittsburgh, Pa.; George Martinson, safety engineer, Pickands Mather & Co., Hibbing, Minn.; W. G. Metzgar, safety engineer, Hudson Coal Co., Scranton, Pa.; J. L. Boardman, chairman, bureau of safety, Anaconda Copper Mining Co., Butte, Mont.; D. D. Moffatt, vice-president, Utah Copper Co., Salt Lake City, Utah; L. T. Sicka, general manager, St. Joseph Lead Co., Bonne Terre, Mo.; A. D. Campbell, safety engineer, McIntyre-Porcupine Gold Mines, Ltd., Schumacher, Ontario, Canada; V. O. Murray, safety engineer, Union Pacific Coal Co., Rock Springs, Wyo.; R. B. Paul, mining engineer, New Jersey Zinc Co., Franklin Furnace, N. J.

C. H. Watson, medical director, American Telephone & Telegraph Co., was elected president of the National Safety Council; W. H. Cameron, council secretary, succeeds himself.

First-Aid Meet and Exhibit Mark State Safety Day

Eighteen teams participated in the first-aid contest which featured Virginia State Safety Day, held Sept. 28, at the high school athletic field, Beckley. The meet formed a fitting climax to the Smokeless Coal and Industrial Exposition, sponsored by the New River and Winding Gulf Electrical and Mechanical Institute, held at an armory across the street from the scene of the first-aid meet. Eighty-six manufacturers and distributors of equipment and mine supplies were represented at the exposition, which began Sept. 26. No technical sessions were held in connection with the exhibition.

First place among white contestants in the first-aid meet was won by a team from Cranberry mine No. 3 of the New River Co., Sprague, which team was captained by C. I. Brown and made a perfect score. Second place went to Eunice mine of the Chesapeake & Ohio Ry. Co. In the colored division first place was awarded to the team from Windsor Power House Coal Co., Power, and second to contestants from Price Hill Colliery Co., Price Hill. Officials of the meet were: N. P. Rhinehart, Charleston; J. H. Nuzum, Hepzibah; H. B. Husband, Eunice; Fred E. Burger,



Winners of first-aid contest in West Virginia

Left to right, standing: Edgar Graff, safety director, New River Co.; J. M. Bowman, superintendent Cranberry No. 3 mine; J. H. Blair, W. P. Williams, M. C. Lawson, M. H. Warden, R. L. Bailey, J. M. McCauley, manager of mines, New River Co., and J. M. Lambert, editor *Employees' Magazine*, New River Co.; kneeling; G. D. Brown and C. I. Brown.

Alloy; J. H. Stewart, Morgantown; Robert Lilly, Mount Hope, and W. W. Dartnell, Wheeling. P. D. McMurrer, Charleston, directed the meet; Charles E. Lawall, Morgantown, was announcer, and J. J. Forbes acted as chief judge.

The industrial exhibit was promoted and managed personally by officers and members of the New River and Winding Gulf Electrical and Mechanical Institute. C. O. Gallaher, Beckley, is president; T. C. Harmon, Glen White, vice-president; and M. K. Clay, Raleigh, secretary-treasurer.

Complimentary entertainments in the evenings of the three exhibit days consisted of a lecture and liquid-oxygen demonstration by the Air Reduction Sales Co.; a lecture and demonstration by the American Telephone & Telegraph Co., and amateur theatricals arranged by T. C. Harman.

All exhibit spaces in the armory and in a tent adjacent were filled. There were 31 booths in the armory and 21 in the tent. Three exhibitors demonstrated heavy equipment on the armory lawn. In many cases, manufacturers were represented by local jobbers and distributors, some of whom exhibited products of as many as ten manufacturers.

A complete list of exhibitors with associate exhibitors (shown in parentheses) follows:

Ahlberg Bearing Co., Chicago; Air Reduction Sales Corporation, Wheeling, W. Va.; Allen-Sherman-Hoff Co., Philadelphia, Pa.; Appalachian Electric Power Co., Beckley; Automatic Coal Burner Co., Beckley; Automatic Reclosing Circuit Breaker Co., Columbus, Ohio (Louis Allis Co., Milwaukee, Wis.).

Beckley Hardware & Supply Co., Beckley; Beckley Machine & Electric Co., Beckley (American Foundry Co., New York City; General Cables Corporation, Buffalo, N. Y.; Rockbestos Cable Co., New Haven, Conn.; SKF Ball Bearing Co., Cincinnati, Ohio); Bluefield Supply Co., Bluefield, W. Va.

Charleston Electrical Supply Co., Charleston, W. Va. (Allen Bradley Co., Chicago; Allis-Chalmers Mfg. Co., Milwaukee, Wis.; Cutler-Hammer Mfg. Co., Milwaukee; Ohio Brass Co., Mansfield, Ohio); Chesapeake & Potomac Telephone Co., Beckley; Cincinnati Mining Machinery Co., Cincinnati, Ohio.

Deming Pump Co., Salem, Ohio; Electric Railway & Equipment Co., Cincinnati; Electric Railway & Improvement Co., Cleveland, Ohio; Enterprise Wheel & Car Corporation, Bristol, Va.-Tenn.; Fairbanks, Morse & Co., Cincinnati.

General Electric Co., Charleston, W. Va.; Goodman Mfg. Co., Huntington, W. Va.; Jeffrey Mfg. Co., Columbus, Ohio; Linde Air Products Co., New York City (Gulf Refining Co., Pittsburgh, Pa.); Long Super Mine Car Co., Oak Hill, W. Va.

Mabscott Machine & Electric Co., Mabscott, W. Va.; McNally-Pittsburg Mfg. Corporation, Chicago; Mine Safety Appliances Co., Pittsburgh, Pa.; Mosebach Electric & Supply Co., Pittsburgh; Mott Core Drilling Co., Huntington, W. Va.; National Electric Coil Co., Columbus, Ohio.

Penn Machine Co., Johnstown, Pa.; Portable Lamp & Equipment Co., Pittsburgh; Post-Glover Electric Co., Cincinnati (Monarch Fuse Co., Jamestown, N. Y.; Universal Pipe Co., Holt, Ala.); Princeton Foundry & Supply Co., Princeton, W. Va.; Pure Oil Co., Beckley.

Raleigh Hardware Co., Beckley (American Oil Co., Chicago); John A. Roebling's Sons Co., Trenton, N. J.; Safety First Supply Co., Charleston, W. Va.; Safety Mining Co., Chicago; Sterling Pump Co., South Bend, Ind. (Buffalo Gasoline Motor Co., Buffalo, N. Y.; Detroit Combustion Engine Co., Detroit, Mich.; Edward E. Johnson, Inc., St. Paul, Minn.; Manistee Iron Works Co., Manistee, Mich.; Skinner Engine Co., Chicago; Uniflow Steam Motor Co., Waukesha, Wis.); Streeter-Amet Co., Chicago; Sullivan Mining Machinery Co., Huntington, W. Va.

Templeton-Kenly Co., Chicago; Timken Roller Bearing Co., Canton, Ohio; Tool Steel Gear & Pinion Co., Cincinnati; Bertrand P. Tracy Co., Pittsburgh; U. S. Bureau of Mines, Pittsburgh; Universal Lubricating Co., Cleveland, Ohio; Viking Mfg. Co., Jackson, Mich.; West Virginia Armature Co., Bluefield; West Virginia University Extension Department, Morgantown, W. Va.

First-Aid Meets Held

Thirty-seven teams competed in the presence of about two thousand spectators at the Western Kentucky first-aid meet, held Sept. 21 at Sturgis, Ky., under the direction of the State Department of Mines and Minerals. First place was won by the Gibraltar Mining Co.'s Brownie mine team, which received a silver trophy presented by the National Coal Association. W. A. Wickliffe Coal Co.'s Browder mine team, Browder, Ky., was second; West Kentucky Coal Co., No. 2 mine, Sturgis, third; and West Kentucky Coal Co., No. 6 mine, Wheatcroft, fourth. In the contest for colored teams, the winner was West Kentucky Coal Co., No. 8 mine, Sturgis; second, the same company's team from the Coil mine, Madisonville.

Kellys Creek Colliery Co. first-aid team carried off first honors at the seventh annual Kanawha Valley safety meet, held Sept. 21 at Montgomery, W. Va. Other teams finished as follows: second, Beards Fork team of the Elkhorn Piney Coal Mining Co.; third, Electro-Metallurgical Co., Alloy. First place in the division for colored teams went to the Elkridge team of the Elkhorn Piney company.

Personal Notes

C. L. Brown, formerly with the West Virginia Engineering Co., has been appointed electrical engineer of mines of the C. H. Mead Coal Co., with headquarters at Beckley, W. Va.

C. A. Cabell, president, Carbon Fuel Co., was again chosen president of the Kanawha Coal Operators' Association at the annual meeting, Oct. 18, at Charleston. D. C. Kennedy was reelected for his 32d term as executive secretary. Other officers who retained their posts were: vice-president, W. C. Mitchell, Hatfield-Campbell Creek Coal Co., and treasurer, John L. Dickinson, Dickinson Fuel Co.

J. A. Hunt, formerly general superintendent, has been promoted to vice-president and general manager of the Lillybrook Coal Co., Beckley, W. Va. J. W. Ailstock, formerly mine superintendent, has been elevated to general superintendent.

Dr. Gerald F. Loughlin has been appointed chief geologist of the U. S. Geological Survey in succession to Dr. Timothy W. Stanton, who is retiring because of age. Dr. Stanton was retained in the service several years past the retirement age through Presidential exemption.

E. F. Miller, last year instructor in the Madison district of West Virginia University mining extension department, has resigned to become safety director at the Wharton mine of the Elkhorn Piney Coal Mining Co., Boone County, West Virginia.

John W. Sands, of Wheeling, W. Va., has been elected president of the Hitchman Coal & Coke Co., succeeding the late E. T. Hitchman.

J. Edward Taylor has resigned as general manager of the Mutual Coal Co., Salt Lake City, Utah, with which he had been associated since its formation. His successor is John R. Doolin, who was secretary for Division V, NRA coal code, and prior to that executive secretary of the Utah Coal Operators' Association (then known as the producers' association). Before taking up association work he was a coal operator with headquarters in Salt Lake City.

L. E. Woods, president, Crystal Block Mining Co., was reelected president of the Operators' Association of the Williamson Field at its annual meeting, held during the third week of October. Other officers chosen were: vice-president, C. A. Hamill, president, Sycamore Coal Co.; treasurer, J. D. McLaughlin, general manager, Earlston Coal Co.

Louis Ware has been appointed president of the United Electric Coal Cos. with headquarters in Chicago. Mr. Ware had early

experience in coal mining and then engaged in large-tonnage copper operations in the West. In 1926 he went to Chile and for three years was in charge of power-shovel operations in the nitrate fields for Guggenheim Brothers. Since 1930 he has been with the New York Trust Co. handling engineering problems and special investigations.

Give Guffey Law "Fair Chance," Demands Illinois Operator

Insisting that the fundamental purpose of the Bituminous Coal Conservation Act of 1935 was not to raise prices but to end "terrible competition in human labor," Hubert E. Howard, president, Binkley Coal Co., in a talk before the national convention of the recently organized American Bituminous Retailers' Association at Chicago Oct. 1, urged that coal men and the general public approach the new legislation with an open mind and give it a fair and sympathetic trial. While it is popular to characterize the Guffey act as "New Deal" legislation, such, he contended, is not really the case because similar proposals had been presented to Congress long before the New Deal was discussed.

Because "they had no union or check on wages in their districts," certain operators for many years, continued Mr. Howard, "sold not coal but human lives and human labor. The stress of competition brought on by the excessive potential production after the war was so great that the wages paid were gradually reduced until they were at the starvation point and conditions of peonage and almost slavery existed in the mining camps of the East and South. Many instances are on record where men worked as long as 14 and 16 hours per day for as low as $1 and $2, with their entire yearly earnings absorbed in company store and hospitalization charges.

"It was these conditions, recognized by labor as a whole and by a majority of far-seeing operators, that brought about the passage of the Guffey bill. The heart of the bill, as I see it, is in two small paragraphs in the labor section, providing that when operators representing two-thirds or more of the tonnage in the United States and a majority of labor agree by collective bargaining upon a schedule of hours, such schedule shall apply to all producers in the United States, and that when the same percentages shall agree upon a wage scale in any district or group of districts, such wage scale shall apply to all producers in such district or group of districts. These provisions, when enforced, should end the degrading of human lives and human labor which has been going on for so many years under the name of competition and price wars.

"Price fixing and governmental control of it, plus the much discussed penalty taxes, are simply devices to accomplish the equality of wages and hours for labor. No sane business man desires government regulation with the attending evils of bureaucratic domination and political interference. Nor is it proved as yet that arbitrary price fixing is either sound economically or workable. But it seems to me that these are objections which are far outweighed by the benefits we should receive in ending this competition in labor with its vicious effect upon the socal structure of our country."

Conveyors, Rectifiers and Labor Relations Aired at West Virginia Institute

INDUSTRIAL RELATIONS vied with engineering subjects as topics of discussion at the 28th annual meeting of the West Virginia Coal Mining Institute, held at the Black Knight Country Club, Beckley, Oct. 4-5, presided over by R. J. Burmeister, president. Conveyor mining, rectifier substations, pressure grouting, explosives and high-voltage transmission satisfied the engineering mind while papers on teamwork and the individual feelings of men appropriately offered suggestions for the increasingly important social problems of the industry.

The degree of success in securing the worker's cooperation, declared Carel Robinson, manager of mines, Kellys Creek Colliery Co., Ward, W. Va., "depends upon the worker's share in the 'community of interest' and the manner in which his share is treated." In settling labor disputes, he had observed that, in a majority of cases, thorough investigation disclosed a vital yet "off-the-record" factor which was more important than the question directly at issue. "The mine worker," he continued, "is as human in his feelings as the mine owner"; consideration of his feelings is included in the worker's right and interest. An abstract of his address is published on page 451 of this issue of *Coal Age*.

A reduction each year from $114,791 as the labor recruitng cost for a division, to $98.91 in 1932 and to nothing for succeeding years was cited by Fred A. Krafft, director of employees' service, Consolidation Coal Co., in an address on "The Possibilities of Industrial Relations in the Bituminous Coal Industry" (abstracted on page 450 of this issue) as a definite example of the advantage to be gained by centralizing all employee activities under a single head.

Conveyor mining has reached the point where the manufacturer must design the conveyor for the particular job, said E. B. Gellatly, manager, underground conveyor division, Jeffrey Manufacturing Co., in a talk accompanying presentation of slides and moving pictures of conveyor work in mines of the Jewell Ridge Coal Corporation, Jewell Ridge, Va., and the Pemberton Coal & Coke Co., Affinity, W. Va. Eighteen different types of Jeffrey conveyors are now available. The Jewell Ridge installation is a six-room unit consisting of chain-flight conveyors emptying onto a 1,500-ft. mother belt conveyor (*Coal Age*, May, 1935, p. 207). Three seven-hour shifts of 27 men each are now producing 700 to 750 tons per day in 42-in. coal. A total move of all conveyors to a new panel set-up costs 1½c. to 2½c. per ton. Maintenance on a six-face unit will run from 2c. to 2½c. per ton. At Affinity all conveyors are of the chain-flight type. Four room conveyors discharge onto a gathering conveyor which in turn discharges onto a short elevating conveyor that loads the cars. Rooms are necked three cuts and the first two loaded out as the entry is developed for a conveyor set-up.

General experience with conveyors has demonstrated that usually it is preferable to furnish a mining machine for each room rather than to cut breakthroughs for transferring a machine. If the mining machine is written off in ten years its cost will approximate 1c. per ton. Ten feet of face is the usual amount allotted per man of face crew, including the cutters. To overcome the difficulty of bent flights the Jeffrey conveyors are now equipped with diverging heads which provide clearance at the head sprockets.

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New Institute Officers

E. B. Agee, superintendent, Youngstown Mines Corporation, Dehue, was elected president of the West Virginia Coal Mining Institute at the annual meeting, held Oct. 4-5 at Beckley. He succeeds R. J. Burmeister, general manager, Raleigh Coal & Coke Co., Raleigh. Vice-presidents elected are: N. P. Rhinehart, Charleston; S. D. Brady, Jr., Morgantown; Carel Robinson, Ward; F. F. Jorgensen, Fairmont, and Geo. Cadwell, Wheeling. The executive board consists of R. E. Salvati, Bartley; E. H. Shriver, Raleigh; W. J. German, Pocahontas, Va.; and T. E. Johnson, Fairmont. Charles E. Lawall, of Morgantown, was reelected secretary-treasurer.

Driving Headings Under Creek

C. F. Carothers, general superintendent, Pond Creek Pocahontas Co., Bartley, W. Va., presented a final review of the driving of headings under a creek after cement had been pumped into the overlying strata through boreholes (*Coal Age*, June, 1935, p. 235). Gas blowers and water from roof and bottom, especially where the headings were driving to the dip, called for unusual methods. Shortwall mining machines were kept out of the water by making the cut 18 in. above the bottom and taking this bottom coal only after the next cut had been loaded out. To get away from the trouble caused by fine coal at the face getting into the reciprocating pumps, centrifugals were substituted and these were fitted with suction boxes 2 ft. square by 8 in. high and covered on the bottom with ¼-in. mesh hardware cloth.

A turtle-back strainer was used on the end of the hose which entered the box through a hole in the side.

Water from overhead leaks was kept off the roadway by corrugated sheet metal or by old belting placed over the headers. On two occasions where gas was blowing from the roof an opening was made in the top of the wood brattice and a trough of old belting used to keep a flow of air diluting the gas. A blower powered by a 440-volt motor fed through armored cable pumped air back of the brattice lines of the two headings. Pipe

lines, power lines, and pumps were all kept on the intake side of this brattice line. Mr. Carothers stated the company believes that the 6,000 bags of cement pumped from the surface and the 1,000 or more bags used on the inside were not wasted. Should a similar condition be encountered, the method would be repeated.

Water power if fully developed in this country can supply only about 2½ per cent of the energy used by the nation, according to R. B. Wilcox, General Cable Corporation, New York City. In connection with a talk on Boulder Dam and the 287,000-volt 271-mile transmission line to Los Angeles, Mr. Wilcox outlined the federal water-power developments now under way. Some of these are located where there exists no immediate prospect of a market for the power, therefore it is of interest to contemplate the several reasons for the developments. Among those that have been mentiond are decentralization of industry, development of natural resources for time to come, reserve power for war emergency and the tendency for the administration to lean toward public ownership of utilities. Copper conductors for the 287,000-volt transmission line are 500,000-circ.mil stranded tubular construction, 1¼ in. in diameter. This large diameter is necessary to prevent corona at high voltage.

Rectifiers for Mine Use

Rectifiers delivering 550 to 3,000 volts d.c. have proved their advantage in railway work and as a result are universally called for by that industry, said J. J. Linebaugh, General Electric Co., Schenectady, N. Y. Improvements in the metal tank rectifier have increased reliability to the point where they are now well suited to mine use. The losses in a rectifier are all in arc drop, therefore depend on current instead of voltage, hence the better efficiency and greater advantages on the higher voltages. In present designs the arc drop is 18 to 22 volts, but there is hope of lowering the drop to 10 or 12 volts.

Seals of Myclex and steel have made it practicable to weld the starting and holding anode connections to the removable steel top of the tank, which improvement has reduced the chance of leakage. Voltage control is secured by grids at the anodes and a variation of 10 per cent either way has little effect on power factor. The voltage can be lowered to any value, even to zero, but at the sacrifice of power factor.

Mr. Linebaugh described the installation of sixty 3,000-kw. rectifiers in the subways of New York City. Each requires 55 gal. of cooling water per minute, and sodium bichromate is added to the water to stop corrosion. These machines can handle 300 per cent rated capacity for five minutes and 600 per cent for short periods. Their efficiency at rated load, including transformers, is about 2 per cent better than motor generators. Absence of arcing and the fact that there are no brushes or commutator to maintain are distinct advantages.

Speaking conservatively regarding rectifiers in general, he said the consensus of opinion appears to be that the maintenance cost is less than for motor generators and about equal or less than synchronous converters. Comparing 275-volt converters and rectifiers, the efficiencies are about the same at full load, but the rectifier is far superior at low loads.

E. B. Agee
President-elect
West Virginia Coal Mining Institute

W. J. German, general superintendent, Pocahontas Fuel Co., Pocahontas, Va., said that for some years the 600-volt d.c. supply for Rolfe mine of the company has been via a rectifier and he has known of no interruptions to the supply. This rectifier is owned and operated by the Appalachian Power Co., and Luther Bates, of the Bluefield office of that company, said the rectifier has been opened for repairs but once in the seven years of service. This 300-kw. 600-volt rectifier replaced a 300-kw. motor generator and raised the substation efficiency from 50 per cent to 85 per cent. The load factor on the substation is 15 to 20 per cent. The only difficulty of consequence with the Rolfe installation was electrolytic wasting of the hose connections supplying mine water to the rectifier for cooling. That trouble was overcome by using rain water collected from the substation roof and arranging for the cooling of this water by contact with pipes carrying mine water. Arcbacks have occurred only after periods of operation at no load. Mr. Bates estimates that maintenance is about one-third that for a motor generator or converter of the same capacity, and he expressed the opinion that in the next few years mining men will recognize the improved efficiency and lower maintenance advantages of rectifiers.

"Our present pellet powders," said E. L. Thayer, in a paper read by U. J. Cook, both technical representatives of E. I. duPont de Nemours & Co., "are so far superior to the first pellet powders as to appear like different products, although there is comparatively little difference in their composition." Although pellet powder had been used in England, it was first introduced in this country in 1924. Through chemical research it has been improved to outclass its foreign predecessor. Of the original duPont grades Nos. 1, 2 and 3, No. 1 was of the lowest density—i.e., it had fewer cartridges per case. The laboratory later worked out No. 4, which is 20 per cent lighter than No. 2 and equally as strong, volume for volume, and this development practically eliminated Nos. 1 and 2 from the market. Recently a No. 5 has been developed, which has the same cartridge count as No. 4 but has a slower action. This No. 5 has superseded No. 3.

A parallel example of development is Gelobel, which was introduced in this country in 1925 following several years' use of permitted gelatines in Europe. It was designed as a stronger (stick basis) permissible for rock shooting. Mr. German, now of the Pocahontas Fuel Co., in making the original tests of Gelobel, found that under some conditions it was useful for shooting coal. Years of laboratory study finally evolved Gelobel No. 4LF, in which the water resistance is reduced but not lost, the count is 120 size 1¼x8-in. cartridges per 50-lb. case, and the original stick strength is maintained.

The development of Nitramon, announced early this year, was an outgrowth of the knowledge of years past that ammonium nitrate, an ingredient of commercial dynamites, could be exploded by itself (without inclusion of a nitroglycerine mixture) with a large primer under certain conditions. The product Nitramon consists of ammonium nitrate of the proper crystal size mixed with a small percentage of non-explosive carbon compounds. Detonation can be accomplished only by a large cartridge of dynamite of at least 40 per cent strength. It cannot be detonated by the largest dynamite caps made and will not explode with the impact of a rifle bullet or with friction; moreover, it will not support combustion.

Speaking at the annual banquet of the institute, W. G. Crichton, of Washington, D. C., looked into the future of coal if it is to hold its place in the domestic markets. The marketing must include a service which will relieve the customer of all work and annoyance. The average customer wants a fuel with which he will have nothing to do except pay the bill.

The next meeting of the institute will be in Logan in October, 1936.

New Preparation Facilities

The Pine Hill Coal Co., Minersville, Pa., has closed a contract with the Wilmot Engineering Co. for installation of a Hydrotator with dewatering screen at Oak Hill colliery; capacity, 20 tons per hour of anthracite silt (clean coal); installation to be completed about Nov. 15.

Carter Coal Co., Coalwood, W. Va.: contract closed with Jeffrey Mfg. Co. for rescreening plant with a capacity of 250 tons per hour of 1⅛ in. x 0, which will be separated into 1⅛x⅜-in. nut, ⅜x⅛-in. pea and minus ⅛-in. slack by a battery of six Jeffrey-Traylor electric vibrating double-deck screens; contract includes conveying, chute and hopper equipment.

Coal Commission Starts District Organization While Lawyers Gird for Court Test

WASHINGTON, D. C., Oct. 24.—While lawyers in the Department of Justice have been busy building up the government defense to meet the attack on the constitutionality of the Bituminous Coal Conservation Act of 1935 when the suit instituted by James W. Carter, president, Carter Coal Co. (*Coal Age*, October, 1935, p. 429), again comes up for hearing before the Supreme Court of the District of Columbia on Oct. 28, members of the National Bituminous Coal Commission have been setting the wheels in motion for the organization of the 23 district boards provided for in the law. Three general orders, promulgating a bituminous code, providing for code acceptance and naming temporary deputy secretaries in each district to call meetings of producers, were issued on Oct. 9. General Order No. 4, defining the status of district sales agencies under the act, was issued yesterday.

General Order No. 1, which promulgates the Bituminous Coal Code, is taken almost verbatim from the Guffey act itself, including Part I—Organization and Production, Part II—Marketing, Minimum Price Area Table, and Unfair Methods of Competition; paragraphs (a), (b), (e), (f) and (g) of Part III—Labor Relations, and the Annex to the Act—Schedule of Districts (*Coal Age*, September, 1935, pp. 390-95). As incorporated in the code these provisions are renumbered as Secs. 1 to 18. In promulgating a code identical with the coal conservation act, the commission sought to place the new code upon an entirely different basis from that of the NRA codes, held unconstitutional. The manner of acceptance of the new code, as provided in the commission's orders also is in exact accordance with the Guffey act. Acceptance of membership in the code, however, does not preclude a legal test of the code, specfic provision for this being made in a clause of the acceptance:

"Neither this acceptance, nor compliance with the provisions of said code, nor acceptance of the drawback provided by said act, shall be held to preclude or estop the undersigned from contesting the constitutionality of any provision of said code or of said act, or the validity thereof as applicable to the undersigned, in any proceeding authorized by said act or any other appropriate proceeding at law or in equity."

The acting deputy district secretaries appointed for the respective districts are:

1. W. A. Jones, Altoona, Pa.
2. D. H. Canon, Pittsburgh, Pa.
3. T. J. Ashcraft, Fairmont, W. Va.
4. Ezra Van Horn, Cleveland, Ohio.
5. Warren E. Pippin, Saginaw, Mich.
6. George A. Blackford, Wheeling, W. Va.
7. P. M. Snyder, Mt. Hope, W. Va.
8. C. E. Bockus, New York City, N. Y.
9. C. E. Reed, Louisville, Ky.
12. M. G. Youngquist, Des Moines, Iowa.
13. James L. Davidson, Birmingham, Ala.
14. S. A. Bramlette, Fort Smith, Ark.
15. W. E. Blucher, Kansas City, Mo.
16. N. C. Brooks, Denver, Colo.
17. P. O. Sandstrom, Denver, Colo.
18. A. R. Litts, Albuquerque, N. M.
19. L. W. Mitchell, Cheyenne, Wyo.
20. B. P. Manley, Salt Lake City, Utah.
21. E. M. Hendricks, Bismarck, N. D.
22. M. F. Purcell, Billings, Mont.
23. D. S. Hanley, Seattle, Wash.

Meetings of producers in the 23 districts will be called to elect and set up the district boards required by the conservation act. It is expected that this work will be completed, at least in a preliminary way, by Nov. 1. The commission reports that the industry is generally accepting the code without reservation. Up to yesterday meetings had been called in these districts:

District 1, Philadelphia, Oct. 26; District 2, Pittsburgh, Oct. 28; District 3, Fairmont, Oct. 30; District 4, Cleveland, Oct. 30; District 6, Wheeling, Oct. 29; District 7, Beckley, Oct. 30; District 8, Cincinnati, Oct. 29; District 9, Louisville, Oct. 31; District 10, Chicago, Nov. 1; District 11, Terre Haute, Oct. 30; District 12, Des Moines, Oct. 31; District 13, Birmingham, Nov. 1; District 14, Fort Smith, Oct. 28; District 15, Kansas City, Nov. 4; District 16, Denver, Oct. 30; District 17, Denver, Oct. 31; District 18, Albuquerque, Nov. 4; District 19, Cheyenne, Nov. 5; District 20, Salt Lake City, Nov. 2; District 21, Bismarck, Oct. 31; District 22, Billings, Nov. 5; District 23, Seattle, Nov. 4.

Reports reaching Washington from the field last week that the commission contemplated reestablishing the old NRA code prices as an emergency stabilization measure were frankly discounted here. The commission, it was pointed out, cannot act on prices under the law until after the district boards have been organized and have submitted their schedules to the commission for its approval. While the statute does set up specific provisions covering sales on contract prior to promulgation of commission-approved prices, there is no control mechanism in the field of spot transactions until after district boards have been organized and take initial action.

Charles F. Hosford, Jr., has been elected chairman of the commission, and N. W. Roberts, formerly deputy coal administrator under NRA, has been chosen secretary. Thomas M. Woodward, formerly vice-president of the U. S. Shipping Board Merchant Fleet Corporation, was named by President Roosevelt on Oct. 11 as consumers' counsel under the Guffey act. He also has served as attorney-examiner for the Interstate Commerce Commission (1914-1920) and as attorney for the Director General of Railroads (1920-1924).

The commission announced on Oct. 19 that it had completed its preliminary organization work and would move into permanent headquarters on Oct. 21 in the Carry Building, 927 Fifteenth St., N.W.

In answering the plea of Mr. Carter for an injunction to restrain the effectiveness of the coal conservation act and to enjoin the Carter Coal Co. from complying with it, counsel for the company declared in the Supreme Court of the District of Columbia on Oct. 4 that it intended to subscribe to the Bituminous Coal Code set up under the Guffey act. The penalty for failure to accept the code, in the form of a 15 per cent tax upon all sales of bituminous coal by the defendant, it was held, "would result in serious damage to the company and might result in its bankruptcy."

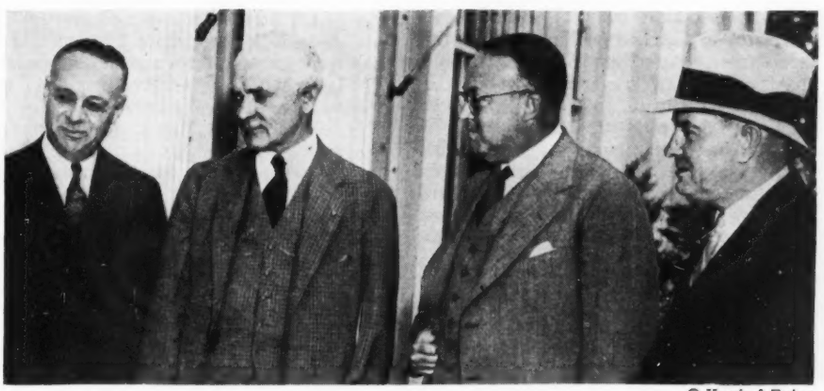
Admitting most of the plaintiff's allegations, the company declared that the Bituminous Coal Conservation Act and the "actions authorized and directed thereby have embarrassed these defendants in the operation" of its business, and that its business cannot be carried on normally until the questions of validity of the statute and the code raised by the bill of complaint are authoritatively determined by the court.

Seeking protection from penalty for failing to subscribe to the code in the event that the court enjoined the company from accepting it, the company asked that if the court should grant an injunction restraining the defendants from assenting to or filing an acceptance of the code, an injunction be issued enjoining collection of the 15 per cent tax provided for by the act.

As government agencies responsible for enforcing the act are linked with the company as defendants, the government filed an answer denying that acceptance of the code would be illegal, unconstitutional or *ultra vires*. Denial also was made of the company's contention that it would suffer pecuniary loss or diversion of business by assenting to the code. On the contrary, it was alleged that acceptance of the code would result in pecuniary advantage to the company.

Justice Wheat overruled the government's request for a trial date after Nov. 25 and set the hearing for Oct. 28.

A similar answer was filed by the government in the case of C. H. Clark, a stockholder in the R. C. Tway Coal Co., who sought an injunction in the federal court at Louisville, Ky., to compel the Tway company to join the code (*Coal Age*, October, 1935, page 429). In support of the constitutionality of the Guffey act, the government points out that bituminous coal is consumed in every State of the Union, ac-



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Bituminous Coal Commission ready to go

Left to right: C. F. Hosford, Jr., chairman; Percy Tetlow, George Acret and C. E. Smith. W. H. Maloney, Kansas City (Mo.) lawyer, the fifth member of the commission, had not reached Washington when these four were snapped.

counting for 45 per cent of the energy consumed for heat, light and power. Though such coal is produced in only 26 States, the answer emphasizes that approximately 85 per cent of it is consumed in States other than the State in which it is mined or by railroads engaged in interstate commerce. "In view of the great present importance of bituminous coal as a source of energy for industrial and domestic purposes," it adds, "and in view of the necessity of transporting it across State lines to reach the great majority of the users, it is of particular importance to the national public welfare that the distribution and marketing of bituminous coal in interstate commerce be not subjected to interruptions, dislocations, burdens or restraints." Hearings will begin Oct. 26.

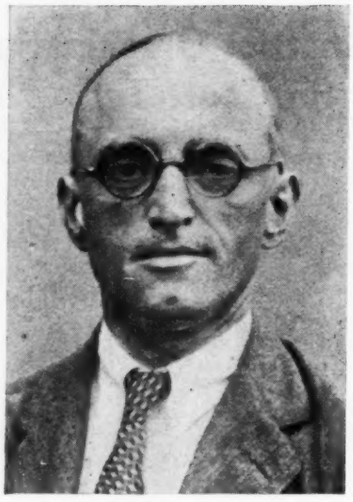
In developing data to support the contention on the interstate character of the coal industry, the Department of Justice officials handling the government's end of these cases have been drawing heavily upon statistics and records accumulated by the bituminous coal section of NRA and by the U. S. Bureau of Mines.

Coal Trade and Locality Names Protected by Courts

Action of the Federal Trade Commission directing discontinuance of the use of the words "New River" when applied to coal not mined in the district of that name in West Virginia has been upheld by the U. S. Circuit Court of Appeals for the Fourth District, sitting at Richmond, Va. The cease-and-desist order of the commission, issued in February, 1934, against the Walker's New River Mining Co., operating in Randolph County, required not only that the company discontinue the use of "New River" in describing coal not actually mined in that district but also that the company eliminate "New River" and/or "N. R." from its corporate name. (The company, according to the listing in the 1935 edition of the *Keystone Coal Buyers Manual*, is now called Walker's Coal Mining Co.)

Judgments for the plaintiff were authorized by the New York State Supreme Court early last month in actions instituted by the Delaware, Lackawanna & Western Coal Co. against Machtenberg et al., trading as Blue Valley Coal & Coke Co., and Werbin et al., trading as Blue Flame Co., on the ground that the trading names used constituted unfair competition and were calculated to lead the public to believe that defendants were selling Glen Alden "blue coal," when such was not the case. The decisions by Justice Julius Miller pointed out that the plaintiff had "colored its product blue for the purpose of distinguishing it from the coal sold by others," and by reason of such coloring and extensive advertising "blue coal has become generally known in this territory as the coal sold exclusively by the plaintiff."

"While this plaintiff," observed the court in the *Machtenberg* case, "may not be entitled to a monopoly in the name or color 'blue' as against one who colors his coal and sells coal colored blue, that question does not arise here, as the defendant does not sell coal which has been colored blue." The defendants, Brooklyn retailers, were given 60 days to make a case.



The late E. H. Suender

E. H. Suender Dies Suddenly

E. H. Suender, 58, recently appointed assistant general manager of operations of the Consolidation Coal Co., died suddenly Oct. 8 of angina pectoris at Fairmont, Va. Widely known in both the anthracite and bituminous branches of the industry, he joined the Consolidation engineering staff early in 1934. For many years previous he had been associated with Madeira, Hill & Co. anthracite operations.

Anthracite Comeback Predicted At Wilkes-Barre Meeting

With progressive anthracite management committed to modernization in production and sales methods and an intensified drive for still lower costs, there is real promise for an early and rapid recovery of the industry, declared James H. Pierce, president, James H. Pierce & Co., in addressing the joint meeting of engineers sponsored by A.S.M.E., A.I.E.E, A.I.M.E, Engineers' Club of the Lehigh Valley and the Wilkes-Barre Chamber of Commerce at Wilkes-Barre, Pa, Sept. 28. The vital part played by the engineer in promoting anthracite progress was outlined by Frank H. Wagner, vice-president, Lehigh Valley Coal Co. Approximately 600 members and guests attended the technical session, which was preceded by inspection trips to near-by collieries, power plants and industries. W. H. Lesser, James H. Pierce & Co., was chairman of the technical session.

Since 1926, said Mr. Pierce in painting the background for his picture of revival, anthracite production has declined 40.3 per cent, average sales realizations have dropped 27.1 per cent, industry income has decreased 56.5 per cent and an average profit of 50c. per ton has been changed into a loss of 35c. High costs and the false hope that an old industry could meet new competition with antiquated methods opened the door to competition of other fuels and their inroads were accentuated by the strike of 1925. While these changes were taking place, lack of harmonious effort within the industry developed and new and inexperienced producers injected "further merchandising mistakes," creating internal demoralization at a time when a united front was necessary. Stabilization was further hampered by the temporary disorganization of the industry's retail distributing structure through the advent of large-scale trucking from mine to consumer and the mining of "bootleg" coal.

Fortunately, in its fight for rehabilitation, continued Mr. Pierce, the producing end of the industry has scrapped traditions which have interfered with recovery. Prices are now the lowest in sixteen years and, assuming proper merchandising methods are used, these prices are on a competitive basis with coke, oil and gas. These reductions have been effected through rigid operating economies and modernization of methods and technique. But "probably the most formidable ammunition for rebuilding and protecting anthracite's earnings and future lies within plans now under active consideration for projecting improved popular-priced equipment for home uses of anthracite and an extensive industry-wide group advertising campaign directed to consumer markets."

That promotion of automatic heating equipment will win back tonnage, he said, is amply demonstrated by the records of one company that has been fostering such efforts. Sales of stokers by a group of New England retailers showed that 76 per cent of the installations made brought back consumers to Pennsylvania anthracite and nearly one-third of the remaining installations were in homes where the home owner was on the verge of switching to oil or gas. During the past summer, anthracite stoker sales through agencies of this producer have also regained business for hard coal and only 5 per cent of these installations displaced domestic anthracite sizes.

Achievements of technically trained men, declared Mr. Wagner, justify the conviction that the research program of the industry should be expanded. Illustrating this declaration with the experiences of his own company, he explained that two years ago the Lehigh Valley organization was faced with the immediate problem of reducing costs to meet declining realization, and as a result placed the question before its engineers. Breakers (including one idle plant) now aggregate but 22 per cent of the number in operation ten years ago, while present production is 78 to 82 per cent of that of a decade ago and would be 100 per cent if the idle plant were running. Accompanying the reduction in surface facilities was a "tremendous" cut in cost, credited largely to the work of the engineers.

Appalachian Coal Scans Future

The future of Appalachian Coals, Inc., was considered at a meeting of the board of directors held Oct. 18 at Cincinnati, Ohio. A committee was named, consisting of C. C. Dickinson, W. J. Magee, W. M. Ritter, W. A. Ellison and H. E. Jones, to canvass the situation in regard to possible modification of the organization's last contract to meet present conditions as well as to make recommendations for continuation of the organization. The committee is to present its report at a meeting of the stockholders to be held in Cincinnati on Oct. 30.

No Action on Base Differentials Before 1937; Large Tonnage Accepts New Scales

BASIC North-South wage differentials —subject of fruitless discussion and controversy since the 40c. differential in day rates in favor of the Southern fields was written into the first agreement negotiated two years ago under Sec. 7 (b) of the original NIRA—will not be changed during the life of the new Appalachian contract signed at Washington, D. C., in the wee small hours of Sept. 27. Decision to postpone action was made by the joint subscale committee authorized by the new agreement to set up machinery to dispose of differential questions not later than Feb. 1, 1936. This committee, at a meeting in Atlantic City, N. J., Oct. 11, concluded that this time limitation would not permit adequate investigation and determination and referred the subject back to the full joint conference scheduled to meet Feb. 17, 1937.

In its report, printed in full in later paragraphs, the committee outlined the procedure to be followed in handling other inter- and intra-district differential questions. The committee also agreed upon the following cutting and loading rates as bases for the four major divisions in the Appalachian field: (1) Pittsburgh thin-vein shortwall-machine cutting and loading rates for the Northern high-volatile area; (2) central Pennsylvania basic shortwall-machine cutting and loading rates for Northern low-volatile territory; (3) Kanawha basic shortwall-machine cutting and loading rates for Southern high-volatile fields; (4) New River basic shortwall-machine cutting and loading rates for Southern low-volatile districts.

The wage agreement of Sept. 27, which became effective Oct. 1 and ended the suspension in most fields which had started at midnight Sept. 22 with the expiration of the fifth extension of the previous agreement, represents a compromise between the original demands of the United Mine Workers (*Coal Age*, March, 1935, p. 135) and the counter-offer of the operators to renew the 1934 contract. In the final negotiations, however, the union receded from its demand for a 6-hour day and scaled down its proposals for increases in tonnage, yardage and deadwork rates. The agreement signed grants an increase of 50c. per day to all day and monthly men except miners on mechanical loading and conveying equipment; this latter group receives an advance of 70c. The combined shortwall cutting and loading rates and the rate on pick mining are increased 9c. per ton. Yardage and deadwork rates are advanced 10 per cent, subject to the proviso that, where tonnage, yardage or footage rates prevail in connection with mechanical loading and conveyor mining, these rates are to be increased in the same proportion as basic cutting and loading rates. The new contract, printed in full in this issue, runs until March 31, 1937.

All districts in the Appalachian field except Harlan, Hazard, Virginia and the southern Appalachian area signed the new contract when it was first drawn up. Hazard and Virginia operators later accepted the agreement after registering protests against the differentials accorded them. The southern Appalachian group, which originally took the position that it could not sign up while competing districts were out of the fold, later expressed a willingness to resume work at the new rates as an "experiment," but were not willing to "obligate themselves to these wages for an 18 months' period." This offer was made after union representatives had turned down proposals to arbitrate. Most of the mines in the Harlan field are reported to be operating at the new wage rate, but without signing contracts. In Muhlenberg and Ohio counties, western Kentucky, United Mine Workers leaders charge that 4,200 union miners have been locked out, but E. J. Morgan, district president, is trying to effect a settlement with the operators. His policy is strongly backed by the rank and file there.

With the Appalachian agreement signed, new scales in other fields began to take shape. Illinois producers belonging to the Illinois Coal Operators' Association accepted a similar agreement with the United Mine Workers, and the Illinois Coal Producers' Association signed a pact on the same basis with the Progressive Miners' organization. The latter agreement, however, is subject to ratification by the membership before it becomes official. In the Alabama field, most of the mines are inactive, as operators and United Mine Workers refuse to compromise.

Not the least interesting development was the signing of an agreement between the United Mine Workers and the H. C. Frick Coke Co., subsidiary of the United States Steel Corporation, with large captive operations in western Pennsylvania. Michigan, Utah, Wyoming, Colorado and Arkansas-Oklahoma operators also came into the fold. Central New Mexico mines are reported to be working steadily, but without a signed agreement.

Appalachian Agreement

This agreement, made the 26th day of September, 1935, between the Eastern Bituminous Coal Association, Georges Creek and Upper Potomac Coal Association, Somerset County Coal Operators' Association, Western Pennsylvania Coal Control Association, Ohio Coal Control Association, Michigan Coal Operators' Association, Northern Panhandle of West Virginia Coal Operators' Association, Northern West Virginia Subdivisional Coal Association, Operators' Association of the Williamson Field, Big Sandy-Elkhorn Coal Operators' Association, Hazard Coal Operators' Association, Kanawha Coal Operators' Association, Logan Coal Operators' Association, Southern Appalachian Coal Operators' Association, New River Coal Operators' Association, Pocahontas Operators' Association, Winding Gulf Operators' Association, Greenbrier Coal Operators' Association, voluntary associations on behalf of each member thereof, and Harlan County, Kentucky, coal operators signatory hereto, and Virginia coal operators signatory hereto, hereinafter referred to as the operators, party of the first part, and the International Union United Mine Workers of America and Districts 2, 3, 4, 5, 6, 16, 17, 19, 24, 28, 30 and 31, hereinafter referred to as the mine workers, and on behalf of each member thereof, party of the second part. (New districts of the United Mine Workers of America may be established in this territory.)

Witnesseth—It is agreed that this contract is for the exclusive joint use and benefit of the contracting parties, as heretofore defined and set forth in this agreement; and it shall be construed as binding upon and effective in determining only the relations with each other of those represented by the parties signatory hereto. It is the intent and purpose of the parties hereto that this agreement will promote an improved industrial and economic relationship in the bituminous coal industry, and to set forth herein the basic agreements covering rates of pay, hours of work, and conditions of employment to be observed between the parties in the following districts constituting the Appalachian territory.

Northern Territory—Pennsylvania, Michigan, Ohio, together with Ohio, Brook, Hancock and Marshall counties of West Virginia, and northern West Virginia, including Counties of Barbour, Braxton, Calhoun, Doddridge, Gilmer, Harrison, Jackson, Lewis, Marion, Monongalia, Pleasants, Preston, Randolph, Ritchie, Roane, Taylor, Tyler, Upshur, Webster, Wetzel, Wirt, Wood, and that portion of Nicholas County including mines served by the Baltimore & Ohio R.R. and north, Maryland and Upper Potomac District, including Grant, Mineral and Tucker counties of West Virginia.

Southern Territory—The State of Virginia, northern Tennessee, that part of Kentucky lying east of a line drawn north and south through the city of Louisville, and that part of West Virginia not included in Northern territory.

Maximum Hours and Working Time

Seven hours of labor shall constitute a day's work. The seven-hour day means seven hours' work in the mines at the usual working places for all classes of labor, exclusive of the lunch period, whether they be paid by the day or be paid on the tonnage basis; except in cases of accident which temporarily necessitates longer hours for those mine workers required on account thereof; and also excepting that number of mine workers in each mine whose daily work includes the handling of mantrips and those who are required to remain on duty while men are entering and leaving the mine.

The seven-hour day, five-day week (35 hours per week), as provided in this agreement, shall prevail.

The following classes of mine workers are excepted from the foregoing provisions as to the maximum hours of work:

All mine workers engaged in the transportation of men and coal shall work the additional time necessary to handle mantrips and all the coal in transit, and shall be paid the regular hourly rate. Outside employees engaged in the dumping, handling and preparation of coal, and the manufacture of coke, shall work the additional time necessary, not to exceed 30 minutes, to dump and prepare the coal delivered to the tipple each shift, and complete the usual duties incidental to the operation of coke ovens, and shall be paid the regular hourly rates. This rule shall not encourage the working of overtime except where it is absolutely necessary to take care of the conditions named.

When day men go into the mine in the morning they shall be entitled to two hours' pay whether or not the mine works the full two hours, but after the first two hours the men shall be paid for every hour thereafter by the hour, for each hour's work or fractional part thereof. If for any reason the regular routine work cannot be furnished inside day men, the employer may furnish other than the regular work.

Drivers shall take their mules to and from stables, and the time required in so doing shall not include any part of the day's labor, their work beginning when they reach the change at which they receive empty cars, but in no case shall the driver's time be docked while he is waiting for such cars at the point named. The method at present existing covering the harnessing and unharnessing of mules shall be continued throughout the life of this agreement.

Motormen and trip riders shall be at the passway where they receive the cars at starting time. The time required to take motors to the passway at starting time and departing from the same at quitting time shall not be regarded as part of the day's labor, their time beginning when they reach the change or parting at which they receive cars, but in no case shall their time be docked while waiting for cars at the point named.

Employees engaged at power houses, substations and pumps operating continuously for 24 hours daily are especially exempted from the seven-hour day provision. Special exemptions for other individual employees than those named above, when 24 hours' continuous operation daily is required, are subject to arrangement between the mine management and district officers. Employees so especially exempted are limited to eight hours per day and 40 hours per week.

Holidays

Holidays now recognized in various dis-

trict agreements shall be effective during the period of this agreement.

Basic Tonnage Rate

Pick mining is the removal by the miner of coal that has not been undercut, centercut or overcut by a machine. The basic rate for pick mining and hand loading of coal shall include the work required to drill, shoot and clean and load the coal properly, timber the working place, and all other work and customs incidental thereto.

A maximum shortwall machine differential of eleven cents (11c.) per net ton between pick and machine mining rates shall be maintained.

Any change in mining methods or installation of equipment that relieves the mine worker of any of the above duties and increases his productive capacity shall be recognized and a piecework rate agreed to therefor properly related to the basic rate.

The standard for basic tonnage rates shall be 2,000 lb. per ton; where the gross ton of 2,240 lb. is the measure the equivalent rate shall be paid.

The basic tonnage, hourly and day wage rates for the various producing districts represented in this conference are shown in the attached schedules, which are parts hereof.

Yardage and deadwork rates in all districts shall be increased ten (10) per cent.

Checkweighmen

The mine workers shall have the right to a checkweighman, of their own choosing, to inspect the weighing of coal; provided that in any case where, on account of physical conditions and mutual agreement, wages are based on measure or other method than on actual weights, the mine workers shall have the right to check the accuracy and fairness of such method, by a representative of their own choosing.

Cars shall be tared at reasonable intervals and without inconvenience to the operation of the mine. Tare shall be taken of the cars in their usual running condition.

At mines not employing a sufficient number of men to maintain a checkweighman the weight credited to the mine workers shall be checked against the billing weights furnished by railroads to the operators, and on coal trucked from such mines a practical method to check the weights shall be agreed upon. Such weights shall be checked once a month.

The wages of checkweighmen will be collected through the pay office semi-monthly, upon a statement of time made by the checkweighman, and approved by the mine committee. The amount so collected shall be deducted on a percentage basis, agreed upon by the checkweighman and clerk, from the earnings of the mine workers engaged in mining coal and shall be sufficient only to pay the wages and legitimate expenses incident to the office.

If a suitable person to act as checkweighman is not available among the mine workers at the mine, a man not employed at the mine may be selected upon mutual agreement.

The checkweighman, or checkmeasurer, as the case may require, shall be permitted at all times to be present at the weighing or measuring of coal, also have power to checkweigh or checkmeasure the same, and during the regular working hours to have the privilege to balance and examine the scales or measure the cars, providing that all such balancing and examination of scales shall only be done in such way and at such time as in no way to interfere with the regular working of the mine. It shall be the further duty of the checkweighman or checkmeasurer to credit each mine worker with all merchantable coal mined by him on a proper sheet or book kept by him for that purpose. Checkweighmen or cheackmeasurers shall in no way interfere with the operation of the mine.

Boys

No person under seventeen (17) years of age shall be employed inside any mine nor in hazardous occupations outside any mine; provided, however, that where a State law provides a higher minimum age, the State law shall govern.

Exemptions Under This Contract

The term mine worker as used in this agreement shall not include mine foremen, assistant mine foremen, firebosses, or bosses in charge of any classes of labor inside or outside of the mine, or coal inspectors, or weigh-bosses, watchmen, clerks, or members of the executive, supervisory, and technical forces of the operators.

Management of Mines

The management of the mine, the direction of the working force, and the right to hire and discharge are vested exclusively in the operator, and the United Mine Workers of America shall not abridge these rights. It is not the intention of this provision to encourage the discharge of mine workers, or the refusal of employment of applicants because of personal prejudice or activity in matters affecting the United Mine Workers of America.

ANTHRACITE SCALE MEETING TO BE HELD DEC. 4

Wage and hour demands to be embodied in the new contract for the hard-coal fields of Pennsylvania will be formulated at the tri-district scale convention scheduled to start Dec. 4. This was decided at a joint conference of international officials of the United Mine Workers and those from the three districts in the anthracite field held Oct. 14 at Atlantic City, N. J. Although the place where the convention will be held was not announced at that time, it is quite likely that Hazleton will be chosen, in view of the well equipped auditorium in the building acquired by the union during the last year in that city. The present anthracite wage agreement expires next April 1.

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Mine Committee

A committee of three (3) mine workers, who shall be able to speak and understand the English language, shall be elected at each mine by the mine workers employed at such mine. Each member of the mine committee shall be an employee of the mine at which he is a committee member, and shall be eligible to serve as a committee member only so long as he continues to be an employee of said mine. The duties of the mine committee shall be confined to the adjustment of disputes arising out of this agreement that the mine management and mine worker or mine workers, have failed to adjust. The mine committee shall have no other authority or exercise any other control, nor in any way interfere with the operation of the mine; for violation of this clause any or all members of the committee may be removed from the committee.

Settlement of Disputes

Should differences arise between the mine workers and the operator as to the meaning and application of the provisions of this agreement, or should differences arise about matters not specifically mentioned in this agreement, or should any local trouble of any kind arise at any mine, there shall be no suspension of work on account of such differences, but an earnest effort shall be made to settle such differeneces immediately:

First, between the aggrieved party and the mine management;

Second, through the management of the mine and the mine committee;

Third, by a board consisting of four members, two of whom shall be designated by the mine workers and two by the operators.

Should the board fail to agree, the matter shall be referred to an umpire selected by said board. Should the board be unable to agree on the selection of an umpire, he shall be designated by the international president of the United Mine Workers of America and the president of the operators' association affected. The decision of the umpire in any event shall be final.

District conferences may establish an intermediate board consisting of two (2) commissioners, one representing the operators and one representing the mine workers, with such powers as said conference may delegate.

Pending the hearing of disputes, the mine workers shall not cease work because of any dispute; and a decision reached at any stage of the proceedings shall be binding on both parties thereto, and shall not be subject to reopening by any other party or branch of either association except by mutual agreement.

Expense and salary incident to the services of an umpire shall be paid jointly by the operators and mine workers in each district.

Discharge Cases

When a mine worker has been discharged from his employment and he believes he has been unjustly dealt with, it shall be a case arising under the method of settling disputes herein provided. In all discharge cases should it be decided under the rules of this agreement that an injustice has been dealt the mine worker, the operator shall reinstate and compensate him at the rate based on the earning of said mine worker prior to such discharge. Provided, however, that such case shall be taken up and disposed of within five days from the date of discharge.

Illegal Suspension of Work

A strike or stoppage of work on the part of the mine workers shall be a violation of this agreement. Under no circumstances shall the operator discuss the matter under dispute with the mine committee or any representative of the United Mine Workers of America during suspension of work in violation of this agreement.

Irregular Work

When any mine worker absents himself from his work for a period of two days without the consent of the operator, other than because of proven sickness, he may be discharged.

Preparation of Coal and Mining Practice

Each district agreement shall provide for the preparation and proper cleaning of coal. Proper disciplinary rules and penalties shall also be incorporated in such agreements.

Safety Practice

Reasonable rules and regulations of the operator for the protection of the persons of the mine workers and the preservation of property shall be complied with.

Engineers' and Pumpers' Duties

When required by the management, engineers, pumpers, firemen, power-plant and substation attendants shall under no conditions suspend work but shall at all times protect all the company's property under their care, and operate fans and pumps and lower and hoist men or supplies as may be required to protect the company's coal plant.

Shifts

The operator shall have the right during the entire period of this agreement to work all the mines, or any one or more of them, extra shifts with different crews.

When the mine works only one shift it shall be in the day time, but this shall not prevent cutting and loading coal at night in addition to the day-shift cutting and loading.

Pay Day

Pay shall be made semi-monthly and at least twice each month.

Coke and Cleaning Plants

Proper rules may be negotiated in district conferences to provide for continuous operation of coking and cleaning plants.

Miscellaneous Provisions

Matters affecting cost of explosives, blacksmithing, electric cap lamps, and house coal are referred to the district conferences.

To the extent it has been the custom in each district, all bottom coal shall be taken up and loaded by the mine worker.

The cutter shall cut the coal as directed by the operator.

District Conferences

District agreements shall be made dealing with local or district conditions, and it is agreed that such district agreements shall embody the basic rates of pay, hours of work, and conditions of employment herein set forth, and all specific rights and obligations of operators and mine workers herein recognized.

This agreement shall supersede all existing and previous contracts; and all local rules, regulations and customs heretofore established in conflict with this agreement are hereby abolished. Prior practice and custom not in conflict with this agreement may be continued.

All internal differences are hereby referred to the various districts for settlement, with the understanding that only by mutual consent shall anything be done in district conferences that will increase the cost of production or decrease the earning capacity of the men.

Proper arrangements for collections for the United Mine Workers of America shall be made in district conferences.

SCHEDULE A—BASIC RATES ESTABLISHED IN THE FOLLOWING NAMED DISTRICTS

	Tonnage Rates Per 2,000 Lb. Run-of-Mine Coal
Western Pennsylvania	
Pick mining, thin vein	$0.89
Pick mining, thick vein	.84
Machine loading, thin vein	.68
Machine loading, thick vein	.64
Cutting shortwall machine, thin vein	.10
Cutting shortwall machine, thick vein	.09
Central Pennsylvania	
Pick mining	.89
Machine loading	.68
Cutting, shortwall machine	.10
Southern Somerset County, Pennsylvania	
Pick mining	.89
Machine loading	.68
Cutting, shortwall machine	.10
Connellsville, Pennsylvania	
Pick mining	.75
Machine loading	.56
Cutting, shortwall machine	.08
Westmoreland-Greensburg, Pennsylvania	
Pick mining	.84
Machine loading	.64
Cutting, shortwall machine	.09
Thick Vein Freeport, Pennsylvania	
Pick mining	.84
Machine loading	.64
Cutting, shortwall machine	.09
Northern West Virginia	
Pick mining	.75
Machine loading	.585
Cutting, shortwall machine	.085
Ohio and Panhandle District of Northern West Virginia	
Pick mining	.89
Machine loading	.68
Cutting, shortwall machine	.10
Michigan	
Pick mining	1.102
Machine loading	.851
Cutting, shortwall machine	.151

Mechanical Loading, Conveyor Devices and Strip Pits

Seventy cents ($0.70) per day increase shall be applied to all miners employed on a day or hourly rate on mechanical loading and conveyor devices, and to all employees engaged in production in strip pits.

Where tonnage, footage or yardage rates are paid on conveyors or other mechanical loading devices, the percentage of increase to be added to such rates shall be the same percentage of increase as is applied to the basic loading and cutting rates.

The following hourly and day wage rates shall be paid in all mines in the Pennsylvania, Ohio, Michigan, northern Panhandle of West Virginia, and the northern West Virginia districts for the classification of occupations shown herein:

Classification of Occupations	Hourly Rate	Day Rate
Inside		
Motormen, rock driller	$0.809	$5.66
Drivers, brakemen, spraggers, snappers, coal drillers, trackmen, wiremen, bonders, timbermen, bottom cagers	.786	5.50
Pumpers, trackmen, helpers, wiremen helpers, timbermen helpers and other inside labor not classified	.751	5.26
Greasers, trappers, flaggers, switch throwers	.557	3.90
Outside		
Bit sharpener, car dropper, trimmer, car repairmen, dumpers	.677	4.74
Sand dryers, car cleaners, other able-bodied labor	.643	4.50
Slate pickers	.557	3.90

Skilled labor not classified to be paid in accordance with the custom at the mine.

SCHEDULE B—BASIC RATES ESTABLISHED IN THE FOLLOWING NAMED DISTRICTS

Maryland and Upper Potomac District, Including Grant, Mineral and Tucker Counties of West Virginia

All Seams except Bakerstown and Waynesburg	Tonnage Rates Per 2,000 Lb. Run-of-Mine Coal
Pick mining	$0.812
Machine loading	.61
Cutting, shortwall machine	.10
Bakerstown Seam	
Pick mining	.87
Machine loading	.73
Cutting, shortwall machine	.10
Waynesburg Seam	
Pick mining	.87
Machine loading	.68
Cutting, shortwall machine	.10
Kanawha	
Machine loading	.582
Cutting, shortwall machine	.09
Logan	
Machine loading	.492
Cutting, shortwall machine	.072
Williamson	
Machine loading	.518
Cutting, shortwall machine	.076
Big Sandy-Elkhorn	
Machine loading	.625
Cutting, shortwall machine	.10
Hazard	
Machine loading	.562
Cutting, shortwall machine	.10
Harlan	
Machine loading	.57
Cutting, shortwall machine	.09
Virginia	
Machine loading	.568
Cutting, shortwall machine	.087
Southern Appalachian	
Machine loading	.59
Cutting, shortwall machine	.10
New River	
Machine loading	.602
Cutting, shortwall machine	.095
Pocahontas-Tug River	
Machine loading	.517
Cutting, shortwall machine	.065
Winding Gulf	
Machine loading	.544
Cutting, shortwall machine	.09
Greenbrier	
Machine loading	.552
Cutting, shortwall machine	.075

Mechanical Loading, Conveyor Devices and Strip Pits

Seventy cents ($0.70) per day increase shall be applied to all miners employed on a day or hourly rate on mechanical loading and conveyor devices, and to all employees engaged in production in strip pits.

Where tonnage, footage or yardage rates are paid on conveyors or other mechanical loading devices, the percentage of increase to be added to such rates shall be the same percentage of increase as is applied to the basic loading and cutting rates.

The following hourly and day wage rates shall be paid in all mines in the Maryland and Upper Potomac District, including Grant, Mineral and Tucker Counties of West Virginia; Kanawha, Logan, Williamson, Big Sandy-Elkhorn, Hazard, Harlan, Virginia, southern Appalachian, New River, Pocahontas-Tug River, Winding Gulf, Greenbrier, Harlan and Virginia districts for the classifications of occupations shown herein:

Classification of Occupations	Hourly Rate	Day Rate
Inside		
Motormen, rock driller	$0.751	$5.26
Drivers, brakemen, spraggers, snappers, coal drillers, trackmen wiremen, bonders, timbermen, bottom cagers	.729	5.10
Pumpers, trackmen helpers, wiremen helpers, timbermen helpers and other inside labor not classified	.694	4.86
Greasers, trappers, flaggers, switch throwers	.50	3.50
Outside		
Bit sharpener, car dropper, trimmer, car repairmen, dumpers	.62	4.34
Sand dryers, car cleaners, other able-bodied labor	.586	4.10
Slate pickers	.50	3.50

Skilled labor not classified to be paid in accordance with the custom at the mine.

The subscale committee of eight operators and eight union representatives, which handled the differentials question, consisted of the following: for the operators, S. D. Brady, Jr., president and general manager, Osage Coal Co.; J. D. A. Morrow, president, Pittsburgh Coal Co.; L. T Putman, general superintendent, Raleigh-Wyoming Coal Co.; J. D. Francis, president, Island Creek Coal Co.; Charles O'Neill, vice-president, Peale, Peacock & Kerr; W. L. Robison, president, Youghiogheny & Ohio Coal Co.; M. L. Garvey, Consolidation Coal Co.; R. E. Taggart, representing the Stonega Coal & Coke Co.; for the union, district presidents Frank Miley, District 31; P. T. Fagan, District 5; Van A. Bittner, District 17; John Saxton, District 28; James Mark, District 2; Percy Tetlow, District 6; William Turnblazer, District 19; Sam Caddy, District 30.

Agreement on Differentials

Whereas, in and by the last Appalachian agreement, bearing date the 26th day of September, 1935, and duly executed by the operators and the mine workers, and effective on the 1st day of October, 1935, the following provisions were made in respect to the settlement of tonnage and day wage rate differentials:

"Within fifteen days after the signing of the Appalachian joint wage agreement the joint sub-scale committee of sixteen (16) of this conference shall meet at the time and place designated by the chairman. The committee shall there and then forthwith draft plans, set up the machinery and establish the procedure to dispose of the disputes before this conference as to tonnage and day-wage rate differentials, and fix the time limits within which final determination of all such disputes shall be made, which in no event shall be later than Feb. 1, 1936.

"In the event the committee is unable within three (3) days to agree upon any matter or matters connected with the performance of this duty the question at issue shall be immediately laid before a judge of the Supreme Court of the District of Columbia, and his decision, after hearing, shall be final and immediately effective. No decision as to rules, regulations or procedure on the part of any commission, board, committee or tribunal selected to dispose of this differential problem shall impose a reduction in tonnage, yardage, deadwork, or day-wage rates on mine workers affected.

"In the event a report requiring changes in differentials is made, the Appalachian conference shall be reassembled on or before Feb. 1, 1936, to make effective such revisions."

As required by the above stipulation of the Appalachian wage agreement, the joint sub-scale committee of sixteen met at the Hotel Traymore, Atlantic City, N. J., on Oct. 10, 11, 12, 1935, and made the following agreement to dispose of the differential disputes that were before the Appalachian joint conference:

I.

That a joint commission be selected by the various producing districts composing the Appalachian joint wage conference with a representative of the operators and a representative of the mine workers from each such district affected, and which district is a component part of the Appalachian joint conference. (The producing districts for the operators are the associations signatory to the Appalachian joint wage agreement of 1935, and for the mine workers the respective districts signatory to that same agreement.)

It is understood and agreed that the joint commission of operators and mine workers, North, South and northern West Virginia, shall have the same voting strength as under the rules of the Appalachian joint wage conference of 1935.

II.

The commission shall immediately organize to carry out the duties and exercise the authority hereinafter set forth:

(a) The commission shall have the authority to conduct hearings, under its own rules and regulations, make investigations of differential questions submitted to it by the Appalachian joint wage conference, and make reports thereon setting forth the facts to be submitted to a general Appalachian joint wage conference to be held on or before Feb. 1, 1936.

The officers of the Appalachian joint wage conference of 1935 shall act as officers of the commission and require districts to name their members to the commission and assemble it for a meeting at the proper time and place.

(b) Upon any question hereinafter referred to the commission, the inter-district joint committees, hereinafter provided, shall make an effort to agree upon the facts and

equity, and in the event of agreement it shall close the case. In the event of failure to agree upon the part of inter-district joint committees the facts and findings of the aforesaid inter-district joint committees shall be reported to the commission.

All reports shall be in writing. Oral argument may be permitted by the commission. Majority and minority reports, or individual reports of members of inter-district joint committees, will be received.

(c) The work of the inter-district joint committees shall be supplemented through the selection of an impartial investigator, who, in the event of a disagreement as to facts, shall be required to submit a report to the commission on all disputed points. Where possible, the impartial investigator shall be selected by the inter-district joint committee. In the event of inter-district joint committees failing to agree upon an impartial investigator, he shall be named by three disinterested members of the commission; the three disinterested members of the commission to select an impartial investigator shall be named by the chairman of the commission and the international president of the United Mine Workers of America.

(d) All complaints shall be filed with the secretary of the commission, on or before Nov. 1, 1935, who shall immediately furnish a certified copy of same to the secretary of each association of operators and the secretary of each district of the United Mine Workers of America signatories to the Appalachian wage agreement.

(e) Inter-district joint committees shall have the right to examine books, records, inspect mines and do any other proper things in order to secure the facts necessary to a complete and intelligent report.

(f) In the event of an agreement requiring a change or changes in rates affecting differentials, such agreement shall be confirmed by the Appalachian joint conference to be assembled on or before Feb. 1, 1936.

III.

In conformity with the provision of the Appalachian wage agreement of 1935, the joint subcommittee of sixteen hereby agrees:

(a) That the Pittsburgh thin-vein short-wall-machine cutting and loading rates shall be used as the basing rate for the high-volatile fields of Northern territory.

That the central Pennsylvania basic shortwall-machine cutting and loading rates shall be used as the basing rate for the low-volatile fields of Northern territory.

That the Kanawha basic shortwall-machine cutting and loading rates shall be used as the basing rate for the high-volatile fields of Southern territory.

That the New River basic shortwall-machine cutting and loading rates shall be used as the basing rate for the low-volatile fields of Southern territory.

(b) That it will be impossible to make proper investigation, determine the facts and equity upon the so-called North-South differential of forty cents a day, and tonnage differentials based thereon, in the time limit fixed—namely, Feb. 1, 1936—and therefore disposes of this question by referring it to the Appalachian joint wage conference to meet in New York City, Feb. 17, 1937, for final disposition at that time.

(c) Intra-district differentials involving the many conditions of operation, the difference in local customs and practices, and mining methods within each of the various districts, are so varied and complex that these questions cannot be settled in the basic Appalachian joint wage conference and were referred to their respective district conferences under the terms of the Appalachian joint wage agreement of 1935.

(d) Inter-district differentials, as to day wage rates, are settled by Paragraph (b) of Sec. III. Inter-district basic tonnage rates, including pick and shortwall-machine cutting and loading rates, will be considered by the commission and reports made under the stipulation of the Appalachian joint wage agreement of 1935.

(e) Any district making complaint against the basic tonnage rate or rates of another district, shall carry the burden of proof in making a showing of just and sufficient cause for the commission to make a report thereon to the Appalachian joint wage conference.

(f) Complaints shall be in writing, signed by the proper officers of the complaining association or district, and can refer only to the basic tonnage rate or rates of another and competing district. In addition, complaints shall state the rate complained about and the amount of the difference alleged to be inequitable and prejudicial to the complainant and preferential to the respondent.

(g) Members of the commission who are complainants and respondents on the same issue or issues, may be designated as a subcommittee by the commission for the purpose of investigation and recommending agreement to the full commission. When the commission lodges a complaint with a designated subcommittee it shall fix the time limit in which the commission will receive the subcommittee's report or reports on the facts in that case. Failure to file such statement within the time limit fixed by the commission, by either party or parties, shall be considered *prima facie* evidence against the cause of such party or parties and the report of the commission to the Appalachian joint conference shall foreclose the introduction of evidence upon the part of the complainant or respondent who failed to file.

(h) Any district having an interest in a complaint may, on a showing of cause, be permitted to examine the subcommittee's report prior to the hearing before the full commission and, if it desires, may file a statement showing the facts as to its interest in the cause.

IV.

(a) The impartial investigator of the inter-district joint committees shall be paid $25.00 per diem and legitimate expenses. This and all other expenses incidental to the inter-district investigations by inter-district joint committees shall be paid equally by the complainant and respondent operators' associations and districts of the United Mine Workers of America represented on same committee.

(b) Expenses of the commission shall be borne jointly by the signatories of the Appalachian agreement, the operators paying upon the basis of their tonnage production for the year 1934, equal to one-half of the cost, and the international union, United Mine Workers of America, paying the other half.

Coming Meetings

- International Acetylene Association: 36th annual meeting, Nov. 12-15, Hotel Cleveland, Cleveland, Ohio.
- Harlan County Coal Operators Association: annual meeting Nov. 20, Harlan, Ky.
- Iowa Coal Operators Association: annual meeting, Dec. 10, Des Moines, Iowa.

Shows How to Modernize

Advantages of modernization of business buildings and other structures are graphically explained in a booklet issued by the Federal Housing Administration entitled "Loans up to $50,000." As part of the government's plan to aid industry (August *Coal Age*, p. 351) the brochure gives in question-and-answer form pertinent information regarding certain provisions of the National Housing Act and the desirability of modernizing for profit. Clear-cut illustrations in before-and-after style show some striking examples of modernization. Copies of the booklet—F.H.A.-180—may be obtained from the Federal Housing Administration, Washington, D. C.

To Combat Diesel Propaganda

A series of six pamphlets which will be part of a campaign to combat diesel-engine propaganda is being prepared under the direction of a joint committee of utility executives and fuel engineers of Appalachian Coals, Inc. The pamphlets will analyze the factors involved in comparing steam- and diesel-engine generated power. Data have been supplied by engineers delegated by the utilities members of the committee, and the material will be compiled in popular language by the ACI publications department. The tentative titles selected for the pamphlets are: "Why Your Power Cost Is So Low," "It Pays Me to Buy Power," "Why Gamble With Your Financial Credit?" "The First and Best Source of Power Is Coal," "A Simple Way to Increase Your Power Cost" and "Believe It or Not—Oil Makes Troubled Waters."

At a meeting of the joint committee, scheduled for Oct. 30 at Cincinnati, Ohio, a study is to be made of the text of the pamphlets, in accordance with arrangements made at the last meeting of the committee. When the committee has completed its study of the text, a meeting is to be arranged at which the pamphlets will be presented before a gathering of representatives of ACI companies, utility executives and power-equipment manufacturers.

Operators Stage Coal Exhibit At Utah State Fair

Emphasizing the virtues of Utah coal for heating with economy and safety, the Utah Coal Operators' Association staged an exhibit in the Mineral Building of the Utah State Fair, held Sept. 28-Oct. 5 in Salt Lake City. With improved industrial and economic conditions, the fair was revived after a lapse of several years, and the attendance exceeded all previous records.

The coal exhibit, which won third prize in the mineral division, was featured by a demonstration of the dustless qualities of Utah slack, which has steadily increased in use for domestic heating. A continuous conveyor raised the slack to a height of 6 ft. and let it fall, showing in unmistakable fashion how little dust it causes.

A modern domestic stoker was shown with the coal exhibit, but a more extensive showing of such equipment was given in connection with modernizing programs of the Federal Housing Administration and building-material firms. While the fair was in progress there also were sixteen varieties of stokers shown in a building on Main St. An attractive exhibit at the fair was an open fireplace with a fire using prepared sizes of coal. Other features included a chart showing what becomes of the Utah coal dollar; a map showing the State's principal coal deposits, with figures setting forth their extent; and a "coal tree" diagram showing the many uses to which coal can be put by engineer and chemist.

Mine Fatality Rate Recedes

Coal-mine accidents caused the deaths of 64 bituminous and 10 anthracite miners in August, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 25,980,000 tons, the bituminous death rate in August was 2.46 per million tons, compared with 3.01 in the preceding month, when 22,252,000 tons was mined, and 2.88 in August, 1934, in mining 27,452,000 tons. The anthracite fatality rate in August was 3.86, based on an output of 2,591,000 tons. In the preceding month the rate was 6.22 on an output of 3,536,000 tons, and in August, 1934, it was 4.19 in producing 3,584,000 tons. For the two industries combined, the death rate in August was 2.59, against 3.45 in the preceding month and 3.00 in August, 1934.

WHAT'S NEW

In Coal-Mining Equipment

LOADING BOOM; TABLE

Pittsburgh Coal Washer Co., Pittsburgh, Pa., offers an improved scraper-type loading boom equipped with a lip-screen near the discharge end to give the coal a final screening before it goes into the car. Special fingers, mounted on a hinge shaft, are provided for closing the openings between screen bars when loading mine-run over the boom. The boom is driven through the boom hinge shaft, which permits, according to the company, the construction of the receiving end on a curve so that the drop from the shaker-screen discharge always remains at a constant minimum. The flights, it is pointed out, hold back the lumps at the discharge end of the boom much longer than the usual pan boom, thereby reducing breakage at this point.

The boom may be used with or without a picking table. The table illustrated, it is stated, is featured by curved pans which form a cylinder as they go around the sprocket, thereby greatly reducing the drop, as the discharge chute may be brought up high and the coal virtually shoveled off the table.

MANIFOLD

A new wall-type acetylene cylinder manifold (Oxweld, Type M-8) is offered by the Linde Air Products Co., New York City. It is available in a 10-cylinder unit to which extensions of five or ten cylinders can be made. The manifold, accepted by the Underwriters' Laboratories

for listing under their "Re-examination Service," consists of two high-pressure heading units. These feed into a central regulation system which delivers acetylene to the distribution piping system at pressures up to 15 lb. per square inch.

Linde also offers the new Oxweld No. 28 Columbium-treated 18-8 welding rod for welding chrome-nickel steels of the 18-8 type. Through the inclusion of Columbium, the company states, products fabricated from "treated" or "stabilized" 18-8 steel by welding with this rod have full corrosion and heat resistance in the as-welded condition. No heat-treatment after welding is necessary.

TIME SWITCHES

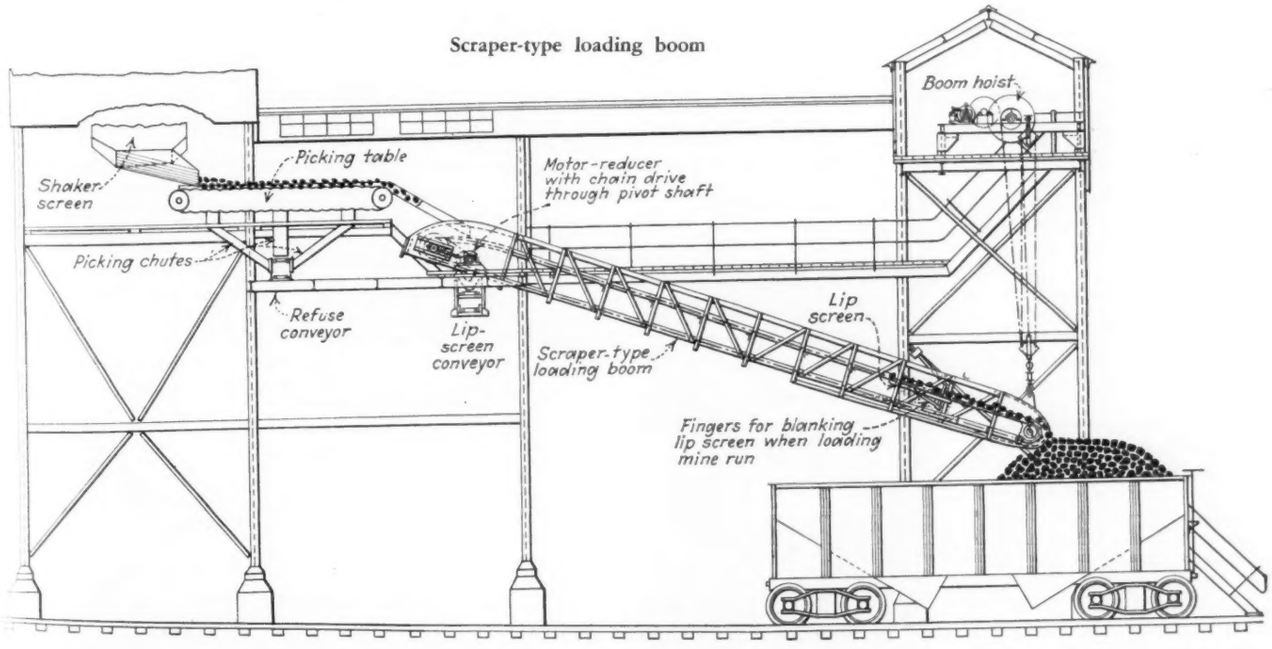
Wide adaptability, simplicity, reliability and low-cost installation and maintenance are features claimed for the new Types T-17 and T-27 automatic time switches offered by the General Electric Co., Schenectady, N. Y., for all general-purpose applications in the domestic and industrial fields. The T-17 switch will control almost any electrical circuit on a schedule related to the time

Time switch

of day, the company states; will perform any practical number of operations per day and can be set to skip one or more days, if required. Standard switches are designed for a.c. circuits, 115 or 230 volts. Current rating is 40 amp. per contact. The triple-pole switch will handle 120 amp., split load, thus saving the cost of additional contactors. Either a plain dial (for fixed time setting) or an astronomical dial (for sun schedules) or certain combinations of both are available. The T-27 switch is similar except that it is not equipped with a weatherproof case or with an omitting device for selected days. It is for indoor service only.

General Electric also offers a new-type phase-rotation indicator without moving parts. Weight is 12 oz. and over-all dimensions are 5½x3½x3 in., thus facilitating

Scraper-type loading boom



transportation. The instrument is recommended by the company for three-phase testing and installation work, and employs two neon glow lamps and a simple circuit which requires no adjustment. Suitable terminals are provided for connection to 110-, 220- and 440-volt circuits. Pressing a central button lights both of the glow lamps. The button is then released and phase rotation—clockwise or counter-clockwise—is shown by which one of the lamps remains lighted.

Phase-rotation indicator

A new unit method of assembling, wiring and shipping speed-regulating resistors for large a.c. wound-rotor motors which conserves space and facilitates installation is another General Electric development. All of the resistor grid boxes for each drive motor, instead of being supplied separately, are mounted in a fan-cooled sheet-metal cabinet with a convenient terminal board on the outside. Because of the positive ventilation provided, the company states, fewer grids are necessary, resulting in a saving of 35 to 50 per cent in space requirements. The grid boxes within the cabinet are wired at the factory to provide the motor-speed characteristics desired, and the terminals — clearly marked — are connected to match up with those on the control panel. These features, plus shipment completely assembled and elimination of the need for additional racks or supports, make installation simple and inexpensive. The construction is recommended for drives of 100 hp. or more, because its advantages, according to the company, are best realized where many grid boxes are required.

A new line of water-tight pushbutton master switches mounted in molded phenolic-compound inclosures and intended for naval-type or equivalent industrial application has been announced by General Electric. Each unit is operated by a molded-compound lever, thus protecting the operator from contact with live parts, and as many as four units may be mounted in one inclosure. The units, designated as CR2940 master switches, provide both normally open and closed circuits. Either momentary-contact or a combination of momentary - contact and latched-in units are available.

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WELDING CABLE

Lincoln Electric Co., Cleveland, Ohio, now offers "Realwear" welding cable for use under conditions of extremely severe wear and abrasion. The cable consists of fine tinned copper wire laid in ropes and stranded, with ropes alternating in direction of lay to prevent distortion in use. The conductor is insulated, it is stated, with a specially developed rubber compound providing firm adhesion between the rubber and the woven-cotton cover, which is provided with an oil-, gasoline-, moisture- and heat-resisting finish. The cable is supplied in Sizes 2, 1, 0, 00, 000 and 0000.

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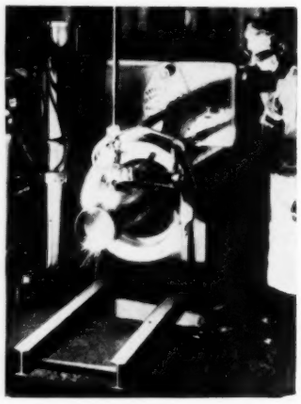
PIPE TOOLS

Oster-Williams, Cleveland, Ohio, offers the No. 212 machine for cutting pipe intersections by torch. This machine, according to the company, will duplicate in design any pattern for practically any kind of a pipe-welding job without the use of cams, templets or special fixtures, turning out finished surfaces with the appearance of lathe-tool cuts. It is designed to handle pipe from 2½ to 12 in., making full-sized reducing tees, 90 deg.; branch reducing tees, 45 to 90 deg.; elbows; miters; Y's; and blunt bull plugs, as well as hole cutting.

Oster-Williams also announces improved models of the Nos. 512 and 521 "Tom Thumb" pipe and bolt machines. Both machines, according to the company, are



equipped with new flared base for greater rigidity and protection against loss of threading oil, and the No. 512 (½- to 2-in. pipe) is furnished with a rack and pinion feed for the diehead carriage and a thread-length indicator. The 521 machine, recommended by the company for bolt threading up to 1¼ in., has an outboard support for the vise carriageways, as well as a rack-and-pinion feed for the carriage.

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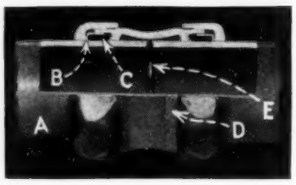
COUPLING

Dresser Mfg. Co., Bradford, Pa., offers the new Style 65 Dresser compression coupling, which it describes as a single self-contained pipe joint, or union, that makes a permanently tight flexible connection on plain-end pipe. Installation, it is stated, takes but a few seconds and the only tool required is a wrench. Two threaded "followers," when screwed up, compress two resilient rubber-compound gaskets tightly around the pipe, effectively sealing in the contents of the line under all conditions. The resulting joint, it is declared, is permanently tight; pipe movements are absorbed; joint-making is greatly simplified, especially



Style 65 compression coupling
A, octagonal follower; *B*, gasket retainer; *C*, armored gasket; *D*, coupling body; *E*, pipe stop (removable).

in cramped quarters; and repairs on existing lines can be made quickly and easily. Sizes are available for ⅜- to 2-in. pipe.

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PUMPS

Open-impeller non-clogging pumps for handling solid materials in suspension, gritty liquids, liquids containing stringy material, etc., are offered by the Worthington Pump & Machinery Corporation, Harrison, N. J., in ratings ranging from 10 to 250 g.p.m. against heads of 10 to 100 ft.; ½ to 7½ hp.; 1,500 to 3,600 r.p.m.; a.c. or d.c.; 50 or 60 cycles; single or polyphase. The pumps, according to the company, are of the rigid "Monobloc" construction—convenient, dependable and low in first cost. Over-all length of the largest size is 23 in. The pumps are available in all-iron, all-bronze or bronze-fitted models, with special metals for special services. Special constructions and characteristics are available where standard characteristics are not suitable.

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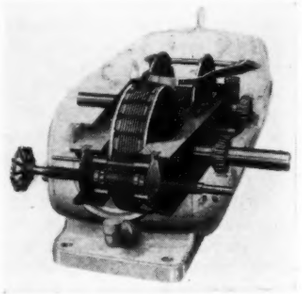
VARIABLE-SPEED UNITS

Link-Belt Co., Chicago, announces that its entire line of P.I.V.-gear variable-speed transmissions is now available in the following combinations and sizes: (1) motorized—when desired — with the motor forming an integral part of the unit; (2) with or without



speed-reduction gearing; (3) with horizontal or vertical box; (4) and in five sizes up to 15 hp. Previously, these units were available only in sizes up to 10 hp. with horizontal box and without reduction-gear sets or the integral-motor feature.

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FLOODLIGHTS

New "Universal" floodlights with permanent reflectors for installation where the cost of standard inclosed floodlights is not justified are offered by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. They also are suitable where a reasonable amount of beam control is necessary and light weight is advantageous, and are available in two sizes, one for 300- or 500- and the other for 750- or 1,000-watt lamps. When desired, the floodlight may be used without lens without damage to the reflecting surface.